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SYSTEM

OF

PRACTICAL THERAPEUTICS.

EDITED BY

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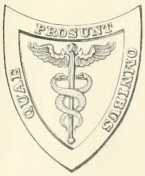
VOL. IV.

WITH ILLUSTRATIONS.



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PREFACE.

The fact that the System of Therapeutics edited by the undersigned met with a most cordial reception on the part of the medical profession indicated that at that time some exhaustive and authoritative representation of practical and modern treatment was needed; and the advances made in this department of medicine have been so great within the last five years that a single volume embodying the present views of the most experienced men in all branches of medicine seems again desirable.

In the preparation of this volume the Editor has kept in mind the fact that it must bring to each reader the personal methods of its various contributors rather than discuss every plan of treatment which has been introduced, whether it be commonly employed or not.

Too often works composed of the contributions of many writers vary greatly in the value of the articles and in the professional standing of their authors, and too often these contributors are largely residents of one district and therefore mirror peculiar local views or measures, so that the work fails to convey the results or the methods employed by men meeting with ailments under various climatic conditions. The wide geographical distribution of the authorities who have written these articles prevents any such fault.

Again, bare suggestions that this drug or that be given in the presence of certain conditions is not what the practising physician wants. He desires definite directions as to its dosage and its prescription, and he wishes to know how the author himself would use the remedies he commends if he were at the bedside. For this reason a large number of illustrative prescriptions are included in the text.

The promptness of the various contributors in sending in their articles and the rapid work of the printing-office enable the Editor to present the most recent ideas as to rational therapy, and he desires to express his appreciation of the courtesy of his collaborators in this very considerable undertaking.

H. A. Hare.

222 S. Fifteenth St., Philadelphia,
May, 1897.

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RECENT ADVANCES IN HYDROTHERAPY.

By SIMON BARUCH, M. D.

In reviewing the subject assigned to the author, he purposes to pursue the line adopted in the article in Vol. I. of this System.

BATHS FOR HYGIENIC PURPOSES.

The principles and methods of bathing for the preservation of health referred to in the article on this subject in Vol. I. have received extensive recognition in this country during the past five years. The brief outline of the theory and technique of the *rain-bath* offered in my earlier contribution has borne good fruit. This fact is evidenced by numerous inquiries received by the author from institutions for details of construction and statistical data; also by the actual construction of rain-baths in many public institutions, asylums, and prisons, the most recent example being the Kings County Penitentiary. The *public rain-bath* has also been freely ventilated. Private philanthropy has provided such rain-baths in several instances in the larger cities of this country. In New York City the Association for Improving the Condition of the Poor in New York has had in full and successful operation for several years a bath-house, consisting of a two-story building of 61 × 27 feet, in which from 75,000 to 80,000 people annually obtain cleansing baths of soap and warm water. The Riverside Association devotes the basement of its building, a space of 68 × 25 feet, to baths, which affords facilities for 400 daily, and was actually used by 30,000 people in twelve months.

These small bath-houses illustrate the advantages of the rain bath for public bath purposes, demonstrating the fact that the same number of bathers would require one hundred times more space, eight times more water, a staff four times larger, if the tub or pool bath were adopted. Nor would the latter be as safe as the rain-bath, or as agreeable and as adequate for cleansing people who are soiled in the course of their occupations.

A more marked advance still in the hygienic utilization of the rain-bath may be chronicled in the passage of a law by the New York Legislature, making mandatory provision for public baths for all cities exceeding 50,000 inhabitants. The authorities of the city have

adopted the rain-bath by reason of its saving of cost and labor and its perfect protection against contagion.

A new era in sanitation has thus been inaugurated during the past five years by the introduction of the rain-bath (as indicated on page 455, Vol. I.) to the attention of the lay and professional public.

HYDROTHERAPY IN DISEASE.

Action of Water.—Considerable advance has been made in recent years in the elucidation of the rationale of the action of water in disease by the researches of Winternitz, Loewy, Cohnstein and Zuntz, Alois Strasser, Vinaj and Maggiora, Thayer, and others.

Effect of Hydrotherapy on the Circulation.—Storoscheff has shown that cold wet packs of thirty to forty minutes increase blood-pressure during the first five minutes. Although this is somewhat diminished later, the actual increase continues for a period of half an hour. The pulse is twelve to twenty beats less, continuing slow and regular for some time. The same effect is produced by douches of a half to one and a half atmospheres for 64° to 118° F. The Scotch douche, consisting of alternating streams of hot and cold water, causes immediate diminution of blood-pressure and renders the pulse-beats slower.

Pressure.—It has been clearly demonstrated by Vinaj of Andorno, Italy, that pressure is an important and hitherto much-neglected element in the therapeutic effect of douches. By means of Mosso's ergograph the muscular resistance to fatigue was precisely measured before and after douches of various temperatures, showing unerringly that each pound of pressure tends to increase the muscular resistance positively. A douche of 50° F. delivered under a pressure of two atmospheres (30 lbs. to the square inch) increased muscular capacity threefold. In an ordinary tepid bath in which pressure plays no rôle the effect on the muscles was absolutely *nil*, while a douche under two atmospheres with water at the same neutral temperature greatly enhanced the working capacity of the muscles.

Unfortunately the importance of grading the pressure of hydriatric procedures has not been so well recognized as that of grading the temperature, hence physicians still labor under the erroneous idea that temperature and perhaps duration are the only important elements in hydrotherapy. The experiments of Vinaj would indicate that attention to pressure-effects would give the physician valuable aid in adapting the douche to the indication of each individual case. Indeed, the neglect of this individualization in hydriatric procedures is one of the causes of the uncertain tenure of hydrotherapy in the minds of the medical profession. Recent literature has demonstrated satisfac-

torily that whenever physicians will as thoroughly familiarize themselves with the effects of water on the human organism in health and disease as they endeavor to do with regard to the effects of medicinal agents, they would surely obtain results which would seem inconceivable from so simple an agent.

The careful experiments of an American physician, Dr. Riley of Battle Creek, Michigan, deserve commendatory mention in connection with this subject. After giving a brief summary of the well-known nervous mechanism—showing how the spinal ganglia with their central and peripheral nerve-extensions form the great afferent paths by which all stimuli acting on the nerves ending in the skin reach the nerve-centres within the body—he correctly insists that the effect of a cool shower-bath depends, within certain limits—

1. On the temperature of the water;
2. On the mechanical impact of the water on the body;
3. On the extent of surface exposed;
4. On the duration of the bath;
5. On the manual force applied during and after the bath in the form of friction.

Placing one arm in water at 70° F. for half an hour makes the muscles of that arm more firm, hard, and elastic to the touch than the other arm, the increased tonicity being produced either by the direct effect of the cold or by reflex stimulation conveyed by afferent fibres to the spinal cord, thence through the substance of the cord by way of collateral bundles (the reflex collateral fibres of Kölliker) to the anterior horn of the gray matter of the cord, and finally through the axis-cylinder process of the spinal motor cells to the muscles.

Riley experimented on the effect of a spray bath at from 55° to 90° F., under ten pounds pressure, upon the pulse and respiration of a healthy man, and found that the cool spray bath reduces the frequency of the pulse from five to twenty beats, diminishing under lower water-temperature and increased extent of surface of application. A temperature of 90° F. lessened the pulse of a feeble individual as much as a temperature of 60° F. did in the pulse of a more robust person. The sphygmographic tracings show that a cool spray bath diminished the length of the upstroke and partially or entirely obliterated the line of descent. Such a pulse-tracing would indicate a narrowing of the calibre of the vessels, producing heightened arterial pressure. By reflex action, this effect when produced on one part of the body, as for instance in one immersed arm, is also noted in the opposite arm to a certain extent. From this result may be safely deduced a similar effect on the blood-vessels of the internal organs (increasing the amount of blood circulating in them), when the entire body is subjected to any cold-water procedure. Passive con-

gestions existing in the internal organs may thus be removed and their functions be materially improved. Thus may be clearly explained the marked effect of cold douches, adapted to each individual case, in ameliorating or entirely removing diseased conditions which have resisted medicinal and other treatment.

The effect of heat and cold upon the *composition of the blood* has been recently studied by numerous observers. Winternitz, who must always stand in the front rank, Rovighi, Thayer of Johns Hopkins Hospital, Loewy, and others have labored in this fruitful field. Under the influence of heat externally applied to the entire body, the blood becomes more watery, the number of red cells being diminished. This result is probably due to a widening of the immense capillary area, and a changed relation of the red blood-cells in the vascular system, due to a stasis in the large interior vessels.

General cold applications to the surface of the body increased the number of corpuscular elements and the quantity of hæmoglobin almost constantly, if the application was not too prolonged. A threefold increase of leucocytes and an increase of nearly one and a quarter millions of red corpuscles, and of 14 per cent. of hæmoglobin have also been observed. this increase continuing manifest to a diminished degree for an hour. These results may be reasonably explained by the effect of cold applications upon the tone and calibre of the blood-vessels. The cutaneous and subcutaneous vessels are contracted by cold, blood-pressure is increased; the heart acts with more force, driving many corpuscles which have lain partly dormant in the byways of the blood-circulation, out into the rapid general current.

Local applications of cold invariably increase the corpuscular elements of the blood at the point of application, while these are decreased in blood taken from parts distant from the latter.

The proportion of white to red corpuscles is changed by cold applications, the former being increased threefold in health and disease, and the condition is usually maintained for half an hour after the cold hydriatric procedure, but sometimes lasts two hours.

The effect of cold and hot applications upon the *calibre of the cutaneous vessels*, and the consequent compensatory changes in underlying muscular and other vessels, have been again clearly demonstrated. The increase of blood-pressure consequent upon cold applications, and its diminution by warm applications, have also been too often noted by reliable observers to be gainsaid. Brief applications of cold improve the "tone" of the muscular coats of the vessels; heat diminishes it.

These pronounced and undeniable effects upon the circulation of the blood in all its phases enable the practitioner to explain to himself all hydriatric procedures rationally, and to practically and under-

standingly utilize water as an auxiliary remedial agent of unsurpassed value.

Clinical demonstrations offer incontrovertible evidence of the progress made in hydrotherapy in recent years. Never in the history of medicine has water received such appreciative recognition as it has obtained during the past few years. In the acute infectious diseases especially, clinical observations of the effects of water have been abundant.

The claims made as to the value of this agent in Vol. I. of this SYSTEM have, therefore, been fully confirmed.

TYPHOID FEVER.

Despite unremitting and conscientious attention given to its prevention and treatment by the medical profession, this disease stands pre-eminent among infectious diseases by reason of its universal prevalence, its fatal character, and the failure of all specific medication.

The idea is now all but universally accepted that we are called upon to combat in this disease a toxæmia which overwhelms the central nervous system and cripples all the organs which depend upon its perfect integrity for their functionating impetus and power. Death ensues in typhoid fever mainly from failure of the heart to perform its function in accordance with the demands made upon it by the changed conditions existing in the organism. Intestinal ulcerations, with their terrific sequelæ, hæmorrhage and perforation, hypostatic pneumonia, embolic processes, indeed most of the lethal complications, are the direct or indirect result of enfeebled heart-action. Heart-failure stands like a spectre at the bedside and bids the physician defiance. How helpless we have been hitherto in its presence, when medicinal agents were our only refuge, every physician knows but too well.

Clinical observation during the past five years has confirmed the view expressed before that the application of cold water in this disease has made a complete change in our position. We now possess a perfect heart-tonic whose action is not otherwise detrimental to the organism, but on the contrary endows it with power to withstand the inroads made upon it by the toxæmia and thus ward off all its resultant dangers. In recent years American clinicians have actively labored to demonstrate the great potency of the Brand method, which in an earlier volume I described and earnestly advocated. We may point with satisfaction to the achievements of James C. Wilson, Pepper, Tyson, and Hare of Philadelphia, Wilkins of Montreal, Peabody, Delafield, Gilman Thompson, and Ball of New York, Osler of Baltimore, Sihler of Cleveland, and of many others, to illustrate that

the American practitioner, though conservative and cautious, is bold in the courage of his convictions.

In Germany many professors have regarded it as incumbent upon them to modify the Brand method to suit their own ideas. As a consequence, cold water alone "remains to tell the tale." Each one of these gentlemen has sought to impress his own individuality upon the method, scorning dependence upon "routine." The logical outcome is that the ideal results achieved by Brand, Juergensen, Vogl, and Strümpell are not obtained by them. Thus it has come about that the "Brand method," which has a definite rationale and scheme which require a definite technique for their attainment, has been mutilated and is becoming a byword in the German clinics. American clinicians, on the contrary, have recognized the necessity of following closely the teachings laid down by that greatest master of fever treatment. Despite their native independence of thought and action, despite their freedom from authoritative domination, they have followed him exactly, with phenomenal results. Indeed, the chief advance in typhoid-fever treatment during the past few years has been in the more complete recognition of Brand's idea that the cold bath does not aim to reduce temperature, but that its chief object is to sustain the nervous system, and that the exact technique of Brand is a *sine qua non*. Prof. Delafield tells his students, "There is but one proper treatment for typhoid fever, and that is by the bath; there is but one proper bath treatment, and that is the exact method of Brand."

Herein lies the kernel of success in the therapy of typhoid fever; every deviation jeopardizes the result. It may be profitable to reiterate here that the Brand method demands the application of baths, at the bedside, of 65° to 70° F., every three hours, with friction, day and night while the body-temperature is 102° F. or more, unless there be hæmorrhage, pleurisy, or other complications demanding absolute rest of the patient. Moreover, a very important element of this treatment is that it should be begun before the fifth day. To demand that the bath treatment be inaugurated before the diagnosis is assured would seem an almost insurmountable obstacle to the execution of this method. I have not found it so, in private practice; hospital cases are rarely admitted so early. It is my custom to begin with a full bath at 90° F., for fifteen minutes *in all fevers* with persistent high temperatures, repeat the bath every three or four hours, and to reduce the temperature five degrees on each repetition, until 65° is reached. Then Brand's rule, to continue baths of 65° F. every three hours, is strictly observed unless chattering of the teeth, cyanosis, or heart-failure demand removal from the tub or discontinuance of the bath. By the gradual introduction to colder baths the patient's

tolerance and reactive capacity are ascertained and symptoms are greatly ameliorated. Thus in the event of typhoid fever developing, an entering wedge has been driven for the scattering of the enemy's forces which are besieging the nerve-centres.

If the rectal temperature be reduced two or more degrees by any one of these baths during the first week, the physician may feel assured that he has not a case of typhoid fever before him, but either a general tuberculosis, a central pneumonia, or some febrile disease of ephemeral character. That the temperature-reduction by the cold baths is feeble in the early days of typhoid fever has been too often observed by the author to be an accidental phenomenon, and he therefore regards the cold bath as a *valuable diagnostic aid* when other evidences of typhoid fever are wanting. Hence the early application of baths varying from 90° to 70° F. in febrile diseases with high temperatures is of great benefit to both physician and patient. Its neglect would seem unpardonable, if thereby we may gain a point of vantage in the event of the development of typhoid fever. The objection is often, however, made that the cold bath is troublesome, cruel, and expensive. There is some truth in these objections, but it is a fact that inasmuch as a mortality of about 20 per cent. is saved, the trouble, expense, and cruelty of the treatment in this number of saved patients is but trifling when compared with the trouble, expense, and cruelty involved in their probable deaths. Until some other less heroic method is discovered the Brand method must remain the most reliable and trustworthy method of managing typhoid-fever patients.

Much has been accomplished during recent years to explain the remarkable effect of cold-water baths in typhoid fever. The investigations of Winternitz, confirmed by Thayer of Johns Hopkins University, have clearly demonstrated an enormous increase of white polynuclear blood-cells in blood taken from the lobe of the ear after each bath. Metchnikoff has shown by his interesting experimental studies that inflammation is but the phagocytic reaction of the organism to an irritant which has invaded it. The white cells are regarded as phagocytes whose mission it seems to be to dispose of microbes or toxins which find entrance into the blood-current. If this be correct (and it has not up to the present time been altogether controverted, although doubts are thrown upon it by other observers), we have one explanation of the mildness of type which systematic cold-bathing in its early stage impresses upon typhoid fever. The enormous increase of polynuclear white cells is really equivalent to a bringing up of a reserve army to meet the invading Eberth bacilli. Moreover, the enormous increase of urine, often reaching 75 to 100 ounces daily, which is an almost constant result of hydriatric measures

in this disease, together with the increase of toxicity in the urine as shown by Ausset, Roque, and Weil, would positively demonstrate an enhanced elimination of toxic elements which are menacing the patient's life. Adding to these the improved action of the heart and the deepened inspiration, and we have a clear rationale of the effect of cold baths in typhoid fever which must strengthen our convictions and overcome all timidity in its application. It remains to briefly recite the clinical data which support the rationale.

Dr. Wm. Osler of Baltimore has recently stated that the mortality of typhoid fever in Johns Hopkins Hospital has been reduced by the Brand bath to 7.1 per cent. Dr. James C. Wilson of Philadelphia has published a series of 524 cases treated in the German Hospital of Philadelphia, with a mortality of 7.25 per cent. Dr. W. Gilman Thompson of New York records a mortality of 7.75 per cent. at the Presbyterian Hospital, and Dr. Francis Delafield has stated in a recent discussion in the New York Academy of Medicine that during the last five years the mortality for typhoid fever has been very different from what it was some years ago, when he had gathered from large hospital statistics a mortality of 20 to 30 per cent.

To sum up, the recent advance in typhoid-fever treatment results from the recognition of the fact that high temperature is not the hydra-headed monster which Liebermeister and his followers had painted it; that while it is of great import and approximately indicates the severity of the disease, it is not a pre-eminent lethal factor; that the endowment of the organism to withstand the inroads of the disease by means of its invigorating and refreshing effect upon the central nervous system is the chief function of the treatment, and that, for these reasons, the Brand bath, which is a methodical, systematic method, and therefore superior to sponging or other slovenly water-practice, deserves all the encomiums which have been bestowed upon it.

Scarlatina.

In the treatment of this disease hydrotherapy has advanced in the estimation of enlightened practitioners. The author has obtained excellent results from brief cold baths or affusions in the early stage of the disease, when high temperature and feeble heart-action seem to threaten collapse, or when the nervous system was overwhelmed by the poison with or without convulsions. He has rescued many desperate cases whose marbled skin, obscured intellect, shallow respiration, and feeble, rapid pulse menaced life, by plunging them into a tub of water at 80° F. for five to eight minutes, with gentle friction, or by seating them in a tub of water at 100° and pouring with some force basins of water at 60° over head and shoulders and chest. Reaction

resulted almost invariably; the marbled hue gave way to a ruddy coloring, the pulse gained in force and vigor, respiration was deepened, intellect cleared, and rarely was a repetition necessary. In no emergency is the effect of a rational application of water more clearly appreciable than in these unpromising cases of scarlatina in any stage of the disease. Dr. Hiram Corson,[1] a practitioner of high standing in Pennsylvania, correctly estimates the value of cold water in this and other eruptive diseases when he says: "Rarely has any one made more careful trial of any remedy than I have made of water in the practice of fifty-nine years under the daily watch of intelligent physicians, anxious, no doubt, for my success, but doubtful of the propriety of my practice and too timid to resort to so heroic a remedy. And now, in closing my career as a practitioner and looking back on the countless fights had with death in hovel and in palace, I can truthfully declare that no means ever used by me, or which have ever been known to be used by others, in scarlet fever, have so successfully warded off blows and shielded patients from harm, and restored them to health, as the use of cold water and ice."

In *measles* and the other exanthemata the same treatment is applicable, as shown recently by Guinon, Hutinel, and others.

Pneumonia.

The application of cold in the treatment of pneumonia has been advocated in recent years by A. Jacobi of New York, Mays of Philadelphia, and others. The former applies the cold bath, or a pack, whenever the temperature rises above 106° F. in the pneumonia of children. The latter has obtained excellent results from ice, wrapped in towels applied around the chest, in the pneumonia of adults. The results published by Mays and others who have adopted the method are so favorable that a discussion of the rationale of its action may not be unprofitable. Mays holds that the ice-pack produces a direct antiphlogistic effect upon the lung, the cold penetrating through the chest-walls and thus reducing the inflammatory process in the affected lung. This theory, however, is untenable in view of its incompatibility with the accepted rationale of the action of moderately intense cold upon the cutaneous surface, as explained in Vol. I., page 468: "It contracts the arterioles and capillaries and thus weakens the face of the peripheral circulation. At the same time the blood is driven into the underlying muscles, which are endowed with more heat and thus offer an obstruction to the invasion of injurious degrees of cold. This protection is enhanced by the reflex effect of cold applied to the surface which produces a dilatation of the vessels supplying the muscles, and by the resultant genera-

[1] *Journal of Balneotherapy*, March, 1892.

tion of heat. As Adamkiewicz has shown, the feeble heat-conducting power of muscular tissue adds another element to the forces which tend to protect the inner organs against dangerous invasions of cold."

These ice-applications would therefore actually prove detrimental, did not the heat of the body melt the ice and thus keep the towels surrounding it constantly damp, diminishing the intensity of the cold, and really converting the cloths covering the ice into a *wet compress*. The good results obtained by Dr. Mays may therefore be more rationally explained as being due to the fact that it resembles the treatment which Niemeyer and Kussmaul have long ago recommended and which has been used by the writer with phenomenal success as the chief element of therapy in pneumonia during the past five years.

Since I rarely depend upon water alone in the treatment of disease, I begin the treatment of a case of pneumonia with twenty grains of calomel, dry upon the tongue, as recommended and successfully applied by Leaming of New York, fifteen years ago. This is the only medicinal agent, outside of placebos, used by the writer. Whenever the body-temperature reaches 100° F. a thick linen compress, slit in the axillary region, so as to fit high up on the chest, is wrung out of water at 60° F. and snugly placed around the entire chest down to the umbilicus. This is renewed every hour if the body temperature is from 100° to 102° F.; every half-hour if it is higher. The results have been very favorable in my private practice, and in that of Dr. Harry Pemberton of Long Branch. In the J. Hood Wright Memorial Hospital (formerly Manhattan General Hospital) the general mortality of pneumonia has been reduced one-half, while in cases coming under treatment before the fifth day the mortality is now 12 per cent. whereas it was 37 per cent. prior to the adoption of this hydriatric measure by the entire staff of the hospital.

The rationale of this treatment rests upon the repeated gentle shock and subsequent reactive stimulus to the periphery conveyed to the central nervous system, deepening the inspiration and removing mechanical obstruction from the bronchi; invigorating the heart by widening the area of the cutaneous vessels and thus contracting the vessels of the nearest underlying parts, which contraction may reach as far as the affected lung-tissue. The symptoms, high temperature, dyspnœa, rapid and feeble pulse, sleeplessness, etc., subside very early; few, if any, stimulants are required, except in habitual drunkards, but crisis rarely occurs. The patients recover slowly but surely. Occasionally a full bath of 90° and not lower than 80° F. for eight to ten minutes with friction may be required when high temperature and brain-involvement become pronounced. In the latter case no medicinal agent equals this hydriatric measure. In children under twelve years these full baths are used by the writer as a routine treatment

every four hours, never omitting frictions over the entire body, especially over the chest. In the intervals between the baths the chest-packs are assiduously applied as long as the rectal temperature registers over 101° F.

Acute Articular Rheumatism.

This is a disease which offers a good field for the application of a mild local hydrotherapy. The writer has confidence in 20-grain doses of pure salicylic acid or oil of gaultheria every two hours until tinnitus aurium ensues, while compresses of three thin layers of linen cloth, wrung out of water at 60° F., are placed snugly around the inflamed joints and covered by thin flannel. Renewed every hour with as little motion of the joint as possible, this has proved an ideal treatment in my hands. The combination of salicylic acid with local hydrotherapy has proved more efficient in severe cases than either treatment alone during the past five years.

Chronic Diseases.

In the chronic and subacute forms of disease, hydrotherapy continues to offer a valuable auxiliary to the forces of nature, which seem to lie dormant in this type of cases. The course of events in acute disease differs from that of the latter, in the ever-present tendency to recover spontaneously in a large proportion of the former. Hydrotherapy displays in acute maladies a decided influence in marshalling the natural recuperative forces into active and successful participation in the combat. Hence it almost invariably turns the tide in favor of the patient when resorted to in the earliest stages. The same principles are involved and the same results are attainable in chronic and subacute diseases, but in a much smaller proportion. This result is due mainly to the fact that hydrotherapy is rarely called into requisition until decided pathological changes have ensued, which the organism, though aided by powerful means, is no longer capable of removing. Here again the hydrotherapeutic principle, *Obsta principiis*, applies. This principle, which has won for the Brand method in typhoid fever its greatest triumph, asserts its force in other diseases, acute or chronic, with like result.

Chlorosis.

The chlorotic girl who has been plied with iron, arsenic, and peroxide of manganese in their numberless combinations, often goes from bad to worse until she falls into the hands of some one who realizes the importance of improving her nutrition by stimulating the nerve-centres, whence all organic functions are derived, and who satisfies the hunger for oxygen in the blood by exposing it to better

air and in more active currents. Days and weeks may be required to train her reactive capacity up to a point at which douches of low temperature and high pressure may be applied without detriment. This moment having arrived, the shock to the periphery awakens an active response in the central nervous system, which sends the blood in joyous currents to the pallid cheek, which deepens the shallow respiration and arouses all the latent energies of her nature. Had a judicious hydrotherapy been earlier applied, while her reactive capacity was not yet in abeyance, much more rapid progress would have been obtained. In all those functional neurotics who are the bane of the doctor's life, as they wander from one physician's office to another in a vain search for help, no remedy approaches in beneficent results the methodical application of water. Many of these cases recover under any judicious management which includes removal from unfavorable environment; they are all, however, more or less benefited by hydrotherapy.

Neurasthenia.

This condition offers a fruitful field for hydrotherapy. For the correct application of the latter, two forms of this many-sided malady must be distinguished—the depressed and the irritable. The former is more amenable to hydrotherapy than the latter. In both the treatment may be inaugurated by ablutions. The patient, standing in water at 100° F., receives from the hollow hand of an attendant, previously dipped into a basin of water at 90° F., dashes of water upon the back and chest and abdomen, with occasional friction with the flat wet hands. The patient is then dried with friction. The temperature of the basin water should be reduced daily one or two degrees until 60° F. is reached. Then larger quantities are poured from a pitcher or basin upon the patient standing in warm water up to his malleoli, beginning with 80° F. and reducing daily one or two degrees until 55° F. is reached. If reaction is good, the water-temperature may be lowered and the quantity applied may be increased. Friction in drying may be discontinued so soon as the patient's reaction is good. It is important that the patient remain in motion in the open air immediately after treatment. If this method do not induce improvement, douches of the same temperature, beginning with 10 lbs. pressure and gradually increasing the latter as the water-temperature is diminished, and prolonging the application gradually from five to thirty seconds, will probably succeed. The aim of this treatment is to arouse the central nervous system, to stimulate by this route the general and local nutrition, and to equalize the abnormal circulation.

In the *irritable* form of neurasthenia, baths and half-baths or hip-baths of 90° F. daily reduced one degree but not lower than 80° F.,

and prolonged for five minutes by gradual increase to fifteen minutes, are useful. Here the shock of low temperature and high pressure must be avoided, because the subsequent reaction would be violent and serve to enhance the existing erethism. Wet packs at 90° to 80° F., of an hour's duration, followed by half-baths of two to five minutes at the same or somewhat lower temperature, with active friction in the bath and afterward, have proved useful in this type of cases.

The most important elements in the management of these cases are individualization and precision in technique. In no therapeutic plan is a correct appreciation of the demands of each case of more import than in hydrotherapy. The writer has often seen cases recover completely after failure under injudicious hydrotherapy. A case of *insomnia*, recently referred to him by Dr. Wharton Sinkler of Philadelphia, may be cited as illustrating this point. The man had been treated for many months at Baden-Baden and in New York by various hydriatric procedures, without result, but his ailment yielded after two months' cautious and watchful application of a precise, graduated, and correctly adapted hydrotherapy. The error in this case, which is referred to as a warning, seemed to lie in the too frequent repetition, two or three times daily, of cold or hot packs, while hypnotics continued to be resorted to. If space permitted many clinical histories might be cited to illustrate the importance of making *an improvement of nutrition* the chief aim of hydrotherapy in neurasthenia and in other functional neuroses. Following this principle, and gradually introducing the patient into the treatment without shock and harshness, will surely verify in the experience of the judicious physician the opinion expressed of hydrotherapy by that most successful neurological therapeutist, Prof. Erb of Heidelberg,[1] that "Its results in all possible forms of chronic nerve-diseases are extraordinarily favorable."

Nervous dyspepsia belongs to the category of functional neuroses, in which hydrotherapy displays the most beneficent results.

Dr. Weir Mitchell recommends the dripping sheet as the most valuable hypnotic for patients subjected to the rest-cure, while F. Peterson advocates baths 70° to 90° F. lasting one-half to two hours, for producing sleep. As a general hypnotic applicable to all forms of insomnia among the insane, Dr. Peterson finds the hot wet pack of astonishing value.

Phthisis.

Phthisis is a disease in which the nutrition is wofully defective. Primarily or secondarily emaciation points with unerring finger to a serious fault in the nutritive processes. From the earliest period of

[1] *Ziemssen's Cyclopædia*, vol. v., art. "Spinal Diseases."

phthisio-therapy it has been the aim of physicians to remedy this faulty condition. How sadly it has failed every experienced practitioner has realized. The Montefiore Home for Chronic Invalids has many records of the brilliant effects of hydrotherapy in improving hæmatosis, increasing heart-vigor, deepening inspiration, and thus putting the staggering organism into condition to wage a more successful combat with the invading bacillus. A recent visit to the great sanitaria for phthisis at Goerbersdorf and Falkenstein, where Brehmer, Roempler, and Dettweiler have made such striking reductions of the mortality of this disease, has convinced the writer how highly hydrotherapy is esteemed by these authorities as an important auxiliary in the hygienic and dietetic management of phthisis. Although the method adopted in these institutions seemed crude and rather heroic, the results were good. It appears to the writer that a more gradual inuring of the phthisical patient to low temperatures and strong pressures would bring even more satisfactory results. Such a method is adopted in the Montefiore Home. As it is briefly referred to above under the head of Chlorosis, it may suffice here to state that the same procedure, barring the very low temperatures (not below 70° F.), may be adopted in phthisis with advantage.

The writer has reported[1] a case of phthisis which had been condemned to exile by an eminent consultant,—tubercle bacilli being found in abundance and all the physical and other signs of the first stage of phthisis being present. This case was entirely restored after five months of graduated hydrotherapy, all medication being stopped. A gain of sixteen pounds and of five pounds over his greatest weight in health demonstrated the value of this treatment in improving nutrition. A brother of this patient, who had also been condemned to exile from home, was similarly restored. Both continue to reside in this city.

Among the hospital cases was one, aged thirty-three, disease of one and a half years' duration, beginning with hæmoptysis, who gained twenty-six pounds and coughed so little that no sputum could be furnished for examination when he was discharged. Another, thirty-six years of age, ill two and a half years, beginning with hæmorrhages, gained twenty-one pounds, lost all bacilli from sputum, and returned to work. Another, aged thirty-one, ill one year, with repeated hæmorrhages, was discharged after one year's treatment, with a gain of twenty pounds, without bacilli and with insignificant physical signs, being able to return to work as a street-railway conductor. These cases, observed by several members of the medical staff, are cited as evidence of progress in the utilization of hydrotherapy in a disease which baffles our best efforts and in which its application is usually regarded with disfavor.

[1] *Medical Record*, 1893.

Chronic Rheumatic Affections.

Sciatica, lumbago, and other forms of *chronic rheumatism*, muscular and articular, are favorably influenced by properly applied hydrotherapy, after failure of other treatment. The hot-air bath with a view to increase perspiration and tissue-change, followed by gradually reduced general douches, and local Scotch (alternating steam and cold jet) douches are praised by Buxbaum and others. Gradually reduced cold douches, to avoid shock and chilling, have proved of surpassing value in the hands of Pospischl and Winternitz, who report some striking cases. I can confirm these favorable results by personal observation in my own practice.

Diseases of the Spinal Cord and Nervous System.

In the therapeutics of the degenerative diseases of the spinal cord, Curran Pope of Louisville claims that hydrotherapy offers the greatest chances of success. He never allows patients to take such baths at home, since the results are not satisfactory, but has them treated at an institution where temperature and pressure may be properly graded.

Leyden and Canova have obtained good results from hydrotherapy in *tabes*. They warn against low temperatures and long-continued treatment.

The *dermato-neuroses* are treated by Beni-Barde with hot douches. *Lichen planus* was successfully managed by him with douches of 95° F. from three to six minutes. Obstinate *pruritus* has yielded in my hands to hydrotherapy after failure of treatment by eminent dermatologists.

These brief notes are cited to demonstrate the progressive use of water in chronic diseases. The results of hydrotherapy may be profitably summed up in the words of Draper, addressed to the New York Academy of Medicine. He claims that hydrotherapy is "useful in all disturbances of innervation depending on or coexistent with instability of the vasomotor system. In cases in which the nutrition has been enfeebled by chronic disease, such as *catarrhal* and *rheumatic affections*, by emotional shocks, or by alcoholic and venereal excesses, and in the protean derangements caused by so-called *neurasthenia*, or *spinal irritation*, in *hysteria* and *hypochondriasis*, the good effects of the cold bath are very striking. It seems to be more effective than any treatment by medicines, stimulating nerve-centres, restoring the equilibrium of the circulation, and reviving the activity of the organic functions. The application of the cold bath requires much discretion and trained intelligence. Its best results require the appointment of a well-ordered establishment, where all the various methods of applying cold by means of water can be wisely and skilfully directed. It is

probable that the methods of application are of less importance than the judicious regulation of the temperature and the duration and frequency of the baths."

In *chronic malarial fever* Strasser, Fodor, and Buxbaum have obtained striking results in the Allgemeine Poliklinik in Vienna, after failure of quinine, from baths of 60° F. for two minutes with some friction, also from colder douches, both administered half an hour before the expected paroxysm.

Remarkable results are claimed by Florian from daily warm baths in *chronic nephritis*, a practice highly commended by Prof. Albin Hoffman of Leipzig.

Conclusions.—In concluding this article on hydrotherapy, the writer would emphasize the fact that hydrotherapy is by no means a universal remedy; that the claims set forth in this article and in Vol. I. are purely for its value as an auxiliary in enhancing vital resistance, endowing the healthy human organism with capacity to resist the invasion of disease, and in sickness enabling it to successfully combat the depreciating forces which conduce to a lethal termination. The author could not disregard the results of his personal clinical observation of one-third of a century, and consent to substitute water for all other therapeutic agents. Drugs which possess the power of reducing or increasing the rate of the pulse, of diminishing or enhancing its tension, of lowering the temperature, lulling to rest the wearied brain, completely abolishing local or general sensation, etc., are entitled to the respectful consideration of the conscientious and broad-minded physician. Water, however, is the most ancient remedy we possess; coming down to us through the ages from the time of Hippocrates, it has, despite its mutations, won a high place in therapeutics. To render this position permanent it is necessary that the general practitioner learn to utilize water correctly, with regard to selection of temperature, duration, pressure, and technique—in short, to apply the same care, skill, and attention which he devotes to drugs. It is the aim of the writer to further this propaganda, the success of which is illustrated in these pages.

MINERAL SPRINGS.

In this branch of our subject no substantial advance has been made recently, except by the utilization and careful study of one spring, which is referred to in detail below. True, many new springs have been exploited, claiming, as usual, properties superior to others; there is, however, more need of a better acquaintance with older springs and not so much with their therapeutic properties, and with the therapeutic methods adopted by the medical men residing near them.

The results obtained at health-resorts are due chiefly to the proper management of the patients and to the correct application of the balneological and climatic conditions in each individual case.

A recent visit to a large number of the most famous springs in Germany has convinced the writer that it is really more important to know the doctor to whom cases are referred than to understand the chemical constituents of the water he applies. The reputation of a spring or Bad is usually earned by the skill of the physicians who there minister to invalids. Instead, therefore, of offering here a résumé of my observations on various new springs and their properties, I propose to enter into a somewhat detailed description of one spring which illustrates the point referred to above, and at the same time presents the most substantial advance made in balneology in recent years.

Bad Nauheim, which is reached in about an hour's ride by express train from Frankfort-on-the-Main, lies nearly 450 feet above the sea-level at the foot of the Taunus Mountains. Nature and art have combined to make it an ideal resort for patients suffering from cardiac affections. This quiet and well-shaded town possesses a number of saline springs, two of which, the Great Sprudel (No. 7) and Friedrich-Wilhelm Quelle (No. 12), supply the bath-houses. The *sprudel* shoots up in a stream several feet high, and falls into a large stone basin, from which it is distributed by pipes into the old and new bathing establishments. The water contains 2 or 3 per cent. of chloride of sodium, 2 to 3 per mille of chloride of calcium, and a large proportion (about $\frac{1}{3}$ c.c. to the litre) of CO_2. The latter is allowed to escape by exposure to the air. The iron contained in it being oxidized, the brine assumes a rusty appearance. Solid salts, obtained by evaporation of the brine, are added to the baths when prescribed by physicians. In bath-houses Nos. 1 and 4, *Sprudelbaeder*, consisting of the carbonic water as it issues direct from the spring before it reaches the exposed basin, is furnished for the wooden tubs, into which it flows as clear as crystal and full of fine bubbles of gas.

The course of baths begins usually with a one per cent. saline bath at 95° F. for five or six minutes; the percentage of salt is gradually increased, and the bath temperature reduced, not below 85° F., while the duration is prolonged gradually to thirty minutes. An occasional intermission of a day is prescribed, as indicated by the effect of the baths. After the patient becomes accustomed to the saline bath and has shown some improvement, he is exposed to the CO_2 baths, and later to the flowing CO_2 baths, which resemble soda-water rushing from a fountain. After the bath the patient is carefully dried with warm sheets and towels, and he is not allowed to make much effort in dressing, but is assisted by the attendant.

The effect of these baths, when carried to the full extent of duration, temperature, and concentration, is to increase the blood-pressure, to enhance the force and diminish the rate of the pulse, and to diminish temporarily the area of cardiac dulness. When the bath-temperature reaches 85° F. an enhancement of the usual effect of baths so much below the body-temperature is observed by reason of the stimulating effect of the saline and CO_2 constituents of the water. After a certain time, depending upon the condition of the patient, a series of mild resisting exercises is begun (*Widerstandsgymnastik*). They consist of nineteen gentle movements of extension and flexion of the muscles of the extremities and trunk made with opposition or resistance by the hand of an attendant. The most important points to be observed are that they be made slowly, without effort and without acceleration of the pulse or the respiration, that each special movement be not made twice, and that an interval of rest obtain after each movement.

The rationale of the system of mineral baths and resisting movements is explained by Schott, one of its originators and promoters, by assuming a reflex stimulating influence upon the cardiac inhibitory centre, by reason of which the pulse is slowed, its tone increased, and the blood-pressure heightened. This theory cannot, however, be maintained in view of the physiological effects of cool baths upon the circulation. It would seem that a far more rational explanation may be found in the well-known stimulating or tonic effects upon the circulation (reflex and hydrostatic) produced by brief applications of water at temperatures below the normal, which stimulation is enhanced by the mineral constituents of the CO_2 gas bubbles, which exert an irritant mechanical effect upon the large cutaneous area. Under this stimulus the cutaneous vessels are dilated—as indicated by redness of the skin when emerging from the bath. This dilatation is not due to relaxation, however, as would be the case after a bath several degrees *above* the normal temperature, but to a stimulation of the entire neuro-vascular supply of the skin, endowing its vessels with increased propulsive power and widening the area of blood-distribution. It has been estimated that the skin is capable of holding 66 per cent. of the entire blood of the human body. But not only is the area of cutaneous vessels increased, but the elasticity of their coats is enhanced. As a result the blood is more vigorously propelled onward, and sufficient normal resistance is created to increase the blood-pressure. In other words, a more normal condition is established in the cutaneous circulation, especially in the arterioles, which are in a state of more or less spastic contraction by reason of retention of products of retrograde tissue-metamorphosis arising from the pre-existing feeble circulation through the emunctories.

In addition to this improved activity of the cutaneous vessels, the muscular vessels are dilated in accordance with a well-known compensatory law. This law provides that when the outer surfaces of the body are exposed to cold, contraction of the vessels ensues, the blood is driven to the surfaces beneath, filling their vessels. If the cold is of brief duration, reaction takes place by reason of which the blood returns to the surface in larger volume and diminishing the supply beneath. If cold is continued, the process of contraction continues, to decided blanching of the surface with corresponding dilatation of the vessels of the underlying parts. If the application is intensely cold, destruction of tissue takes place, as is well known, but this destruction is limited by the larger blood-supply of the underlying parts, protecting the latter against damage. When, after the mineral bath of 82°–90° F., the patient emerges and is rubbed with a warm cloth, producing redness by dilating the cutaneous vessels, the blood is drawn from the muscular vessels and the latter are contracted by the enhanced tonicity of the muscles. The result of this stimulus of the peripheral circulation is increased blood-pressure, more vigorous systole and more complete emptying of the ventricle. The heart is not hampered, as in the case of digitalis, by contracted arterioles, but on the contrary is aided by their supernormal activity. The gentle exercises have precisely the same effect on the muscular vessels. Thus may be explained the immediate effect of these mineral baths upon the force and rhythm of the heart, the increased tension and diminished rate of the pulse. This explanation, viz. the contraction of the muscular arteries and (tonic) dilatation of the cutaneous vessels, disposes of the contradictions involved in the rationale offered by various observers, Bezley Thorne, Schott, Saundby, and Broadbent. As a result of the more vigorous systole and less impeded circulation in the peripheral vessels, improvement in the secretion of urine ensues, which in turn reacts beneficially by eliminating toxic products.

A diminution of the area of cardiac dulness has been noted by many independent observers in Germany and in England, and is confirmed by Newton M. Heinemann of New York, who is well known for acuteness of observation and accuracy of statement. How much of this diminution of area of cardiac dulness may be due to the actual effect of the baths and exercises and how much to the percussion over the area which is resorted to for the purpose of outlining it, remains in doubt, when we consider that M. Heitler[1] has shown by actual experiment that an enlarged area of cardiac dulness was invariably diminished by tapping over it. Be this as it may, the clinical results demonstrate the value of this treatment. In a paper read before the

[1] *Ueber die Wirkung thermischer und mechanischer Einflüsse auf den Tonus des Herzmuskels,* Wien, 1894.

Verein für innere Medizin, Berlin, in February, 1894, Dr. Heinemann related 77 cases observed by him at Nauheim, which he studied very closely. Of these, 40 visited the springs for the first time. Of the remaining 37, 25 returned three times or oftener, 15 four times or oftener, and 11 five times or oftener. This statement would indicate that the majority of the cases treated at Nauheim had improved sufficiently to warrant the continuance or repetition of the treatment. In a large proportion the patients reported that they were enabled as its result, during the succeeding winter and spring, either to dispense with medicinal treatment or to obtain far better results from it than hitherto.

Nearly all disturbances of the circulation are adapted for the Nauheim system, especially valvular disease with loss of compensation. True angina should be treated by baths chiefly. Graves' disease, congenital cardiac defects, also hearts enfeebled by influenza, are sometimes benefited. Dropsy does not contraindicate the treatment; it is not infrequently removed by it. Cirrhosis of the liver and nephritis, great debility, aneurism of the aorta, and pronounced forms of arterio-sclerosis are contraindications to its use.

Without indulging in utopian ideas, I regard the Nauheim system of treating certain cardiac diseases as a permanent improvement in therapeutics provided it is followed judiciously on the lines laid down by Schott, Groedel, and Heinemann, and the treatment be not delegated to nurses. The latter should be carefully watched and supervised. I have seen in Nauheim even the gymnastic exercises given in a most slovenly fashion, the important elements of slowness in the movements and rest between them being entirely overlooked by the nurse.

In all procedures connected with physical therapy, especially hydrotherapy or gymnastics, a correct technique is all-important. Therefore it is far better to follow the prescribed rules of an expert like Brand in typhoid fever or like Schott in cardiac diseases, than to assert one's independence of thought by deviating from it to the detriment of the patient. (See article on Heart Disease.)

THE PRESENT TREATMENT OF TUBERCULOSIS.

By S. EDWIN SOLLY, M. D.

In consequence of the discovery by Koch of the tubercle bacillus as the central and constant factor of tuberculosis, there arose a method of treatment by drugs which aimed at the direct destruction of the bacillus in the tissues. During the past ten years a hundred or more different substances have been used to effect this purpose, introduced through the mouth, bowels, respiratory tract, skin, or directly into the lungs through the thoracic walls. With comparatively few exceptions favorable results were at first reported, but at the present time most of these treatments have been abandoned as unsatisfactory, and none are now endorsed and used in the chief hospitals and sanitaria. Experimenting, however, still continues with the view of finding a chemical specific for tuberculosis, but there is only one of these drugs whose use is still popular and widespread, and that is creasote.

While there is a broad consensus of opinion that, under certain conditions, creasote is a valuable aid in arresting tuberculosis, it is almost universally conceded that it is not a specific; and, indeed, experiments have proved this to be the case.

The announcement by Koch of the antitoxic quality of tuberculin was the beginning of the various and interesting experiments with different ingredients of tuberculous matter to which are ascribed, with more or less proof, anti-tuberculous qualities. The crude tuberculin, introduced by Koch and at first used extensively in all parts of the world, has now been abandoned in consequence of the death and disaster which resulted from its administration; though it must be admitted that occasionally this treatment has apparently caused a remarkable arrest of the disease. It is stated that the tuberculin now used is purged of its dangerous components and is diluted, and it is certainly given with more discrimination and care than was the case on its first introduction. Experiments are still being carried on with the various modified tuberculins, and excellent results are reported by some physicians, but the remedy is not received with confidence and support except in a few instances, either by the leaders or by the rank and file of the profession. The value of the evidence

in its favor is often obscured by the commercial element which is not unfrequently associated with its application. Another cause which clouds a just estimate of its merits is the fact that its use at the present time is generally limited to a selected class of cases, viz. those in an early stage, which are non-febrile, and which show very slight reaction to the tuberculin injections. In short, they are usually cases in which the prognosis is favorable under ordinary good general hygienic treatment. Again, the majority of these cases is treated in sanitaria, in which institutions, as the writer has shown by statistics, the general percentage of improvement is higher than in open resorts, whose climates are not markedly superior, so that this has often to be taken into account among the reasons for improved results. Moreover, the results share in a measure the higher percentage of improvement always reported, for a time at least, in regard to all new modes of treatment.

Why the first reports of new remedies, many of which are diverse in character, should so commonly be favorable it is not easy to explain. There are, however, certain points in connection with the exhibition of these therapeutic measures which demand full consideration in all attempts to solve the problem. Tuberculosis is for the most part a chronic and slowly advancing disease, whose prognosis is generally gloomy, especially in the minds of the laity, while the usual methods of regulating the diet, exercise, habits, and climate for the tuberculous patient have a sameness, lack of novelty and sensationalism, and consequently, under the régime laid down to the consumptive,

> "Life is as tedious as a twice-told tale
> Vexing the dull ear of a drowsy man."

This lethargy reacts upon the physician, and there is a deadly dulness all round; but—infuse the physician and the patient with the excitement that comes from trying some new and highly vaunted remedy, and presto! the scene changes: hope springs eternal in the human breast, and all is animation and bustle, and if the physical difficulties are not insurmountable we may witness the triumph of mind over matter and see the tide set toward recovery. The less that is known of the remedy the better the chance that the psychic force will prevail, for there is no truer adage than *Omne ignotum pro magnifico.*

Tuberculosis, as is conceded, most often attacks those of a nervous temperament, over whom mental impressions have the greatest power, and in whom, for the most part, there has been some depression of nerve-force preceding, causing, and also resulting from, their illness.

Improvement may be due not only to these various mental influences upon the physician and his patient, but also because, being mutually aroused, they turn all their thoughts and energies toward

a cure, and in consequence the doctor sees his patient frequently, keeps up his hope and courage, inquires more particularly into his daily life, and even into the condition of his bedroom and his wardrobe—most important details, too often neglected; while the patient, believing that his efforts, if continued for a few months, will bring him health, remembers his medicine, obeys instructions, and foregoes forbidden pleasures. Thus there is a hearty co-operation in using the far-off rivers of Abana and Pharpar instead of the languid interest shown in taking a bath in homely Jordan.

Sometimes, of course, there is scepticism exhibited by one, or both, as to the results of the remedy, but in spite of this there will still remain the element of an aroused attention to general hygienic measures, and a mind stimulated and therefore ready to receive impressions; and, further than this, we know that the reaction from scepticism to belief is often rapid and complete as soon as the first impulse toward it is felt.

Moreover, the element of suggestion, which undoubtedly affects the patient in a greater or less degree, is frequently present.

It is also too true that the element of cupidity has sometimes a powerful influence upon the honest weighing and reporting of the evidence of the physician.

Thus we see that many causes conspire to give an apparent value to remedies which time and experience do not confirm. These and similar considerations are, however, by no means arguments against the careful, intelligent, and scientific experimentation for specific, or new and improved, methods of treatment; nor can it be denied that, in certain instances, specific treatment appears to have accomplished its purpose, or, at least, to have given hope of future success. However, the evidence of the value of specific therapy, as a whole, has not been taken with sufficient breadth and care, nor for a long enough period, for us to decide upon a treatment from practical demonstration.

While the study of the causes, nature, natural history, forms, and variations of tuberculosis has rapidly advanced during the last few years, yet the knowledge thus gained is still too imperfect to allow of our founding upon it a positive specific germicidal treatment. We are yet in ignorance of what is the best point of attack—the bacillus tuberculosis itself, the toxins it develops, or the streptococci and kindred micro-organisms which accompany the later development of the disease.

Tuberculin.

The action of antitoxins in tuberculosis, as in other germ-diseases, is still shrouded in mystery; it is not yet known whether, when antitoxins act favorably upon a disease, it is through direct destruction of the germs or through a stimulating, alterative, or educational influ-

ence upon the leucocytes, phagocytes, or other germicidal constituents of the body.

It has been demonstrated that injections of tuberculin will destroy much and sometimes all of the ulceration of lupus, but there generally remains more or less cicatricial material in which bacilli are still found and which needs surgical treatment before healing takes place.[1]

From this fact it would seem that the tuberculin has power to destroy tuberculous masses, but only imperfectly to affect those which are imbedded in the fibroid and inflammatory defences raised around the ulcers. For this and other reasons the tuberculin treatment of lupus has been practically abandoned. Clinical experience, and the results of autopsies in cases of pulmonary tuberculosis which have been treated with tuberculin, strengthen these opinions concerning lupus. While the evidence is in favor of the power of tuberculin to destroy tuberculosis when it can be brought in contact with it, it can readily be understood from the ocular demonstration furnished by its use in lupus how, in pulmonary tuberculosis, much of the tuberculous mass is inaccessible to its action, and this accounts in a measure for its failure. Of course, even if the existing tuberculosis is all destroyed by the antitoxin, there is still the soil in which it grew to be regenerated, and the tendencies and weakness of the individual to be rectified. Liebreich[2] asserts, and in this he is supported by Hausemann and Saalfeld, that hypodermic injections of cantharidin will cure lupus without leaving cicatrices. It is also asserted by Abraham, Bramwell, Lake, and, more recently, by Barclay,[3] that thyroid injections have the same effect.

It would appear probable that antitoxins such as tuberculin do not act directly upon the special poison, but indirectly, through their stimulating influence upon the germicidal qualities of the tissues or blood, or by conferring an insusceptibility upon the cells. The strongest evidence of this is perhaps afforded by Calmette's[4] experiments upon snake-poisons. Both he and Fraser have extracted an antitoxin from snake-poisons, and have rendered animals immune by inoculations with it, prior to, coincident with, or even subsequent to, the injecting of the poison. Immunity was also secured if the antivenin was first mixed in a certain proportion with the venom, and the mixture thus formed injected. Fraser concludes that a chemical substance is produced in the blood derived from the venom. Calmette, on the other hand, believes the immunity is due to a sort of immediate insus-

[1] Koehler, *Berlin. klin. Wochenschrift*, 1894, p. 845. Carrucio, *Clin. dermo-sifilopatica della Università di Roma.* Malcolm Morris, *British Medical Journal*, June 3, 1893, p. 1154.

[2] *Berlin. klin. Wochenschrift*, April 8 and 15, 1895.

[3] *British Medical Journal*, Oct. 24, 1896.

[4] *Ibid.*, Oct. 3, 1896, p. 910.

ceptibility of the cells of the body in respect to the venom; his reason being that if the mixture of venom and antivenin is heated at 80° F. before injection, poisoning results, the antidotal power of the antivenin being destroyed. So the probable theory is that an antitoxin acts, not directly on the poison, but on the tissues or blood. It was shown by Fraser that the portion of the antivenin necessary for immunity was least when a mixture was injected, that it increased when the antivenin and the poison were administered separately, and was still greater in proportion to the length of time allowed to elapse between the injections of the poison and the antivenin. Kanthack writes: "Artificial immunity therefore depends neither on a direct germicidal nor on an attenuating power acquired by the serum and fluids of the protected animal." As evidence in favor of this belief he points out how Buchner[1] shows that a mixture of a toxin and an antitoxin which was harmless to mice was poisonous to the more susceptible guinea-pigs, showing that the toxin had not been destroyed but only placed in relation to a force which acted in antagonism to it when they were together brought to bear upon the tissues of the animals into which these fluids were injected.

It is undoubtedly true that treatment with the early, crude tuberculin was dangerously destructive, generally carrying the disease beyond its original limits, and increasing ulcerative and suppurative processes; and this the writer's experience confirms. On the other hand it would appear as if, in the modified tuberculin, the destructive element had been eliminated and possibly the immunizing property retained, unless, indeed, it may be that the tuberculin has only been diluted into inertness, and that the favorable results obtained are simply those which would usually follow upon the general good care of as equally highly selected a class of cases as those which are now usually reserved for tuberculin treatment. It is but just, however, to say that so careful and unprejudiced an observer as Trudeau believes that he has proved by experiments upon animals that immunity can sometimes be obtained from the use of tuberculin, and the evidence he gave to the writer was certainly favorable to this conclusion.

Dr. Sandberg, surgeon to the Bergen Hospital, in a valuable article entitled "The Use of Tuberculin in Surgical Diagnosis,"[2] after detailing a number of cases of surgical tuberculosis treated with tuberculin, sums up as follows: "If we now summarize the results of the treatment with tuberculin in these cases, it is at once clear that tuberculin is a reliable diagnostic agent in surgical tuberculosis; but with regard to this there has been heretofore no difference of opinion—the dispute has been regarding the therapeutic value of the remedy. My opinion

[1] *Allbutt's System of Medicine*, vol. i. p. 570.
[2] *British Medical Journal*, Oct. 17, 1896, p. 1109.

is that in my cases the results obtained might have been reached equally well by any mode of treatment. I dare not, in any special case, blame the tuberculin for the bad result, as the patient who now feels best was the one injected with the greatest quantity, in all about 130 mg.; he looks remarkably well and is quite stout. I do not, as said before, attribute this to the tuberculin, but think it proves that the remedy need not necessarily have any injurious effects, either locally or generally. But, in my opinion, its diagnostic value in the tuberculous joint-diseases is proved. As, however, it cannot be proved to possess any curative power in the treatment of tuberculous joint-diseases, it ought to be struck out as worthless. As an exception it might in certain other cases of local tuberculosis, such as the one instance of epididymitis mentioned above, have some significance in a therapeutic respect, otherwise its value is only as a diagnostic."

The prevention of the establishment of a disease, and its cure when established, are different matters; and results obtained from inoculated animals, in which the disease is an acute affection, are different to what may take place in a chronic disease—which human tuberculosis usually is; so that, while the experiments with tuberculous antitoxins are sufficiently encouraging to warrant their continuance, it is undoubtedly true that the use of tuberculin in practice is as yet of doubtful value and is still only experimental. These experiments are too numerous to allow of separate discussion here.[1]

Seropathy.

Seropathy began to be used in the treatment of tuberculosis when it first appeared as if the use of tuberculin had failed. Dr. E. Maragliano, of Genoa, first described his serum treatment to the British Medical Association, in London, in 1895.[2] He used a serum which, he stated, was free from bacilli, but contained their poisonous extracts. With this, by progressive vaccinations, he immunized dogs against tuberculous injections, and he demonstrated that, if he injected tuberculin accompanied by immunized serum, no reaction took place, but it did so when the tuberculin alone was used. He treated 82 cases of pulmonary tuberculosis in human beings, with favorable results. He pronounced the treatment to be harmless and usually beneficial. The chronicity of the case is not necessarily against success, but mixed infection generally is. Later he has written[3] that if he first destroys the germicidal power of the serum by heat, and then mixes it with tubercle bacilli, the resulting fluid will produce tuber-

[1] For further information see *Year-book of Treatment*, Lea Brothers & Co.

[2] *British Medical Journal*, xi. p. 444.

[3] *La Presse médicale*, 1896, No. 47, p. 273; *Il Policlinico*, 1896, No. 10, p. 213.

culosis on inoculation, whereas, if the serum be not heated, inoculation will fail.

Dr. G. H. Roger, at the Third French Medical Congress, in commenting upon Maragliano's experiments on tuberculous animals (whereby he cured 16.26 per cent. and had improvement in 48.5 per cent.) says that the course might be different in a diseased man from that in an inoculated animal, as in the former, anti-intoxications and other influences would come in. He also referred to the results from the use of Marmorek's anti-streptococcal serum as being too diverse as yet to tend toward definite conclusions.

Maragliano[1] further reports on the use of serum in human pulmonary tuberculosis, and from these reports the following table has been compiled by the writer, showing the quality of the cases and the results. He repeats his previous statements in regard to the harmlessness of the treatment, and urges its early use.

TABLE.

Statistics in regard to the use of Maragliano's serum.	No. of cases.	Apparently cured.	Markedly improved.	Stationary.	Worse.	Percentage of improvement.
1. Destructive broncho-pulmonitis with cavities. With fever 129; fever disappeared in 55	168	14	75	50	29	53
2. Destructive broncho-pulmonitis without cavities but with microbic complications. With fever 94; disappeared in 54	127	12	71	35	9	64
3. Diffuse febrile broncho-pulmonitis with and without destruction of tissue. Fever disappeared in 107	220	10	121	67	22	59
4. Diffuse apyretic broncho-pulmonitis with and without destruction of tissue	68	2	54	12	0	82
5. Circumscribed febrile broncho-pulmonitis. Fever disappeared in 69 cases	81	33	45	3	0	94
6. Apyretic circumscribed broncho-pulmonitis	48	33	13	2	0	92
Totals	712	104	379	169	60	68

In 74 per cent. of the cases fever was present. In 52 per cent. of these the fever disappeared.

496 of the cases were weighed, and 60 per cent. gained.

In regard to these cases the details of the treatment and general care which accompanied the use of the serum are unknown to the writer. He is also ignorant as to the permanency of the reported improvement, but these are very important points in judging of the value of the injections.

Richet,[2] after continuing his experiments with Hericourt upon animals, concludes that normal serum retards, and microbic serum prevents, the development of tuberculosis.

Dr. R. Paquin[3] of St. Louis reports on the use of his special

[1] *Gazetta degli Osp. e delle Clin.*, Oct. 18 and 20, 1896.

[2] *Soc. de Biologie*, Jan. 12, 1895.

[3] *Medical Record*, Sept. 19, 1896.

horse anti-tubercle serum, and the method of its production: 206 cases of human tuberculosis were treated, of which he says that less than 10 per cent. were early cases; 40 completely recovered, 110 sufficiently to return to work, and 76 did not improve or remained stationary, so that there was a total of 66 per cent. benefited.

Dr. L. B. Edwards[1] reported treating 14 cases with the Paquin serum. Of these 2 were desperate and died; 3 completely recovered; 6 improved, and 3 no longer declined; so that 64 per cent. were benefited.

Dr. Dunwoody of Cripple Creek reported on 4 cases treated with by him with Paquin's serum; 3 improved.

Dr. Bernheim[2] of Paris reported favorable results in 300 incipient cases treated with serum from immunized animals, but the time of reporting was too short to give the permanent results.

Rheumatic Virus.—Dr. Lanigan[3] treated tuberculosis by injecting blood-serum from rheumatic persons with favorable results.

Vaccine Virus.—Dr. Turiansky[4] reports favorable results with vaccine, as also does Tyndale.

Anthrax Virus.—Dr. Perroncito[5] found that cattle vaccinated with anthrax virus were immune to tuberculosis.

Anti-streptococcal Injections.

The fact has been recognized that the destructive processes of tuberculosis, at least such as are accompanied by ulceration, are due to the association of streptococci with the tubercle bacilli, and these are called cases of mixed infection. Marmorek, with a view to arresting these processes, has extracted an antitoxin from the virus of streptococci, and has succeeded in immunizing animals. Favorable reports of its use upon tuberculous human beings have been made, but, at present, nothing very definite is established. "The Relations of the Morbid Conditions depending on, or associated with, the Presence of Streptococci," is the title of an interesting article on this subject by Dr. G. H. Woodhead.[6]

The general conclusions concerning the antitoxic treatment which may fairly be drawn up to the present time are well expressed by Kanthack[7] in the following words: "The antitoxic treatment has hitherto been tried in man in several diseases, and a short summary of results may be acceptable at this point. Its success is so undoubted in diphtheria as to silence all opposition, and to lead us to hope for better and better results. It is a specific remedy, and it surpasses

[1] *Medical Record*, Sept. 19, 1896.
[2] *Sajous' Annual*, 1896, vol. i. A, 30.
[3] *Ibid.*, 1890, vol. i. A.
[4] *Year-book of Treatment*, 1893.
[5] *Ibid.*
[6] *British Medical Journal.*
[7] *Allbutt's System of Medicine.*

any other which has ever been employed for the treatment of this disease." He further says, however, "One serum after another has been vaunted as a curative agent in tuberculosis; the dog, the goat, and the ass have had false pretensions thrust upon them, and recently Maragliano has come forward with an anti-tuberculous serum, which, however, is evidently not a true antitoxic or immunity-conferring serum; it seems rather to act as a modified tuberculin, raising the temperature considerably on injection, and producing other physiological changes as a rule not observed with protective serums. Moreover, Maragliano's observations are not based on sound experiments; he fails, at any rate, to record any successful preventive inoculation of susceptible animals. Our great difficulties in tuberculosis are the protection of the individual from secondary infections, and the removal of the latter when they have once made their appearance."

Nuclein Treatment.

This treatment is founded on the theory first advanced by Metchnikoff, that the white blood-corpuscles act as phagocytes in destroying micro-organisms which are foreign and dangerous to the tissues, and it was with the idea of reinforcing this protective quality that the nuclein treatment was tried. Nuclein is the principal chemical constituent of the living parts of cells, and is the chemical basis of the nucleus. The nucleins used are obtained from blood-corpuscles, casein, egg, salmon sperm, and yeast. The experiments of Victor C. Vaughan of Ann Arbor, Michigan, tended to show that nuclein derived from polynuclear white cells is the germicidal constituent of blood-serum. This conclusion has been corroborated by McClintock and others. Huber has proved that nuclein injections increase the number of white corpuscles, chiefly of the polynuclear cells, that the amount varies with the individual, and that the increase is observed within three hours of the injection and disappears after forty-eight hours. It is established that more or less immunity can be obtained for animals against the effects of inoculation with such fatal germs as the diplococcus of pneumonia by previously and frequently repeated injections of nuclein, and the results are retarded if the nuclein injections shortly follow the poisonous inoculations. The results following injections of tuberculous matter are not so marked as in the case of most other poisonous inoculations. The process does not appear to be directly germicidal, but educational. No bad effects from its use are reported. The majority of experimenters believe it to be of avail only in early and limited cases of tuberculosis. Below is the summary of the latest results reached by Dr. Vaughan with which he has kindly furnished me:

"The cases reported in this and the preceding paper include all

those in which the tubercle bacillus was found, treated by me with yeast nucleinic acid, from May, 1893, to December, 1895. There has been no selection of cases to report, and no exclusion. Many were in the last stages of the disease when the treatment was begun. Indeed, some of these were at that time confined to their rooms and died within a few weeks. In my study of the value of yeast nucleinic acid in the treatment of tuberculosis, I have endeavored to carry out the investigation as I would a series of laboratory experiments, and, above all, not to deceive myself. Of the 76 cases reported, 70 are those of pulmonary tuberculosis. Of these, 30 ($42\frac{6}{7}$ per cent.) have died. Of these, at least 9 were temporarily benefited.

"Of the 70, 17 ($24\frac{2}{7}$ per cent.) have been continuously free from the bacillus for from nine months to two and one-half years, so far as can be determined from the sputum. That is, either there has been during this time no sputum to examine or that examined has failed to reveal the bacillus. To the best of my knowledge, another has been free from the bacillus for more than a year, and another has been free from the bacillus with the exception of a short time, and still another was free when last examined.

"20 ($28\frac{4}{7}$ per cent.) were still infected at the last examination. Of these, 16 have been apparently improved by the treatment.

"It should be stated that none of these were hospital cases. I was not able to control their diet. Most of them were in moderate circumstances and had only inexpensive food. The hygienic conditions under which many of them have lived have not been satisfactory.

"I have reached certain positive and definite conclusions concerning the value of the 1 per cent. solution of yeast nucleinic acid, administered daily in doses of from 60 to 80 minims, hypodermically, and these conclusions I will now give:

"1. In advanced stages of the disease, in which the area of involvement is large, with or without cavities, the best that can be expected from this treatment is temporary improvement. Even this does not occur in all cases.

"2. In initial cases, when the area of infection is limited, this treatment may, and often does, not only arrest the progress of the disease, but it acts as a curative agent."

In connection with the part played by the leucocytes in tuberculosis the account of some recent researches by Stein and Erbmann are interesting. Their conclusions after examining 60 cases of tuberculosis were in brief as follows:

Stein and Erbmann state that the number of the white cells is normal in initial phthisis, but after hæmoptysis there is temporary moderate leucocytosis. It is marked in cavitations, in chronic sup-

puration following caries, in final exudative processes, and in hyperplasia of lymph-glands. If the other conditions mentioned do not exist and yet leucocytosis is present, the diagnosis of a cavity may be made. In all other conditions leucocytosis is absent. The cause is a secondary infection, a septic process which may be the result of various bacteria.[1]

Whether the successful results obtained in patients undergoing the nuclein treatment are due to these injections, and not solely to some one or other of the general causes spoken of in the beginning of this article, it is yet too soon to say. Granting, however, that they are the cause, we must be still in doubt as to why they act beneficially—whether as nucleins, or as phosphorus injections, or in some other unknown way.

Antiseptic Treatment.

Dr. J. E. Squire, physician to the North London Hospital for Consumptives, writes, concerning the use of antiseptics in tuberculosis, substantially as follows:[2]

If you estimate the average amount of blood as one-thirteenth of the body-weight, a man weighing 130 pounds would have 10 pounds of blood in his system; so that, to make a 5 per cent. solution, there must be half an ounce of an antiseptic dissolved in the blood, and this would have to be frequently renewed. Holscher has shown that this cannot be done, although both he and Cornet procured partial immunity in guinea-pigs by creasote injections.

However, the active tubercle bacilli are, for the most part, surrounded by inflammatory products which block up the blood-vessels, and therefore they cannot be reached by antiseptics through the blood. He goes on to say that antiseptic inhalations can modify the condition of the tubes, and mitigate the virulence of the secretions coming from the foci, and so prevent disease from spreading to the other parts of the lungs; at the same time they diminish the influence of the streptococci and other poisonous bacteria. He says that, theoretically, he believes that antiseptics cannot cure the disease, and with this his clinical experience is entirely in accord, but they may do good by lessening hectic, etc., through affecting the streptococci.

In a discussion on a paper by Dr. J. W. Moore of Dublin at the meeting of the British Medical Association, August, 1896, the consensus of opinion seemed favorable to general hygienic measures, and not to specific treatment. Creasote, however, was favorably spoken of by the majority.

It is impossible to consider in detail the numerous antiseptics which have been recommended in the treatment of tuberculosis, and

[1] *Deutsches Archiv für klinische Medicin*, 1895; see *Medical Record*, July 25, 1896, p. 123.

[2] *British Medical Journal*, Jan. 25, 1896, p. 208.

regarding which favorable clinical reports are given. So far it has been the history of an enthusiastic début upon the therapeutic stage, a short appearance and then retirement into obscurity, followed by the ushering in of another drug which repeats the experience, and so on *ad infinitum*—a passing show. While it appears possible to the writer that some of the antiseptics may in time win a permanent place in the treatment of tuberculosis, the evidence of their merit, except in some few instances, where they act favorably upon certain symptoms, has yet to be proved, and, assuredly, as the disease is at present known, it is scarcely rational to expect to find a chemical specific. Of the drugs that entered the field as such, there is, however, one whose prolonged and widespread use and reputation deserve fuller consideration, and that is creasote.

Creasote continues to be extensively used. The majority of reporters do not believe that it is a specific, but consider that better results are obtained when it is used in addition to general hygienic, tonic, and nutritive measures.

Theories of its Action.—Of the theories put forward to explain the mode of its assumed beneficial influence, the most usual are that it acts as an antiseptic and stimulant to the digestive tract, that it benefits the catarrhal condition of the respiratory tract, while Audeon and others consider that its action is one which may be called "substitutive irritation," and they believe that it especially promotes fibrosis around the tuberculous masses.

Suitable Cases.—The preponderance of opinion is against its use in febrile, acute, florid, or erethic cases. Some authorities, such as S. Solis-Cohen, claim, however, that it is markedly beneficial when there is fever or breaking down of tissue, as well as in catarrhal conditions.

Dosage.—During the years first following its introduction it was considered that the drug should be pushed to the utmost limit of the patient's endurance, and the amount taken was often enormous, but now the majority of physicians are in favor of moderate doses.

Method of Administration.—Creasote is given through the mouth in the greatest number of cases, and perhaps most frequently in the form of capsules, though many adhere to the earlier method of administering it in wine. The method of administration by capsules has gained ground of late years because of the fact that, as creasote not infrequently provokes irritation of the gastric mucous membrane, the capsules containing it are now usually coated with keratin, which is stated not to dissolve until it comes into contact with the juices of the intestines. To avoid its action upon the stomach Audeon and others give it by enemata. It has also been used quite extensively by subcutaneous injection; this plan has been markedly successful in

reducing the fever, but the method is somewhat painful. The rubbing of guaiacol on the surface reduces the temperature in a pleasanter manner. Injections around tuberculous areas have been used in surgical tuberculosis, and Chappell reports good results by this method in laryngeal tuberculosis. Inhalations of creasote are still resorted to, but as they are frequently irritating, blander antiseptics are beginning to be more generally used.

Personal Experience.—The writer, by reason of his practice in a health-resort to which patients come from all parts of the world, has had unusual opportunities of studying the use of creasote in a variety of persons. He finds that the majority of patients when they arrive in Colorado are taking creasote by advice of their home doctors, though it would seem as if creasote was not quite so popular with the leading consultants as formerly, and the dosage is markedly reduced. It has been the custom of the writer, unless there are evident reasons for an immediate change, such as gastric irritation, to instruct these patients to continue with the creasote, but to report promptly as soon as they are not feeling well; this advice has been given guardedly so as to avoid showing any apparent connection between the creasote and possible future symptoms. The result of this course has been that the majority develop sooner or later more or less gastric irritation, unless they are taking very small doses or have unusually good digestions, the febrile cases being the soonest affected. Whether there is possibly an increased hyperæsthesia of the gastric membrane, through the greater energy of the vascular and nervous systems which is apparently more or less induced during the stage of acclimatization to a high altitude, particularly in delicate persons, it is impossible to say. If this theory be correct it would be simply due to local causes; the writer's experience is corroborated by that of the majority of his colleagues. On the other hand, it may be that if the evidence of cases treated for as long a time at sea-level was taken widely, it would confirm the Colorado experience. While it is not possible accurately to compare cases, particularly in private practice, because the life and environment is so varied, yet the writer's impression is that in the same quality of cases, in Colorado, those who do not take creasote do at least as well as those who are under the creasote-treatment. This, of course, is leaving out patients to whom it is given beneficially for fermentative dyspepsias or bronchorrhœas.

There are some reasons which may serve to explain why the reports of the use of creasote should be so favorable. These are that the cases in whom the creasote-treatment is continued are usually those with a strong digestion, the feeble ones being generally dropped off the roll so early that they are not counted, and again, the same may be true of the febrile cases—that they are usually omitted from

those chosen for the creasote-treatment, or the treatment is abandoned in these cases in so short a time that they are not counted in the results; therefore, if it be true that the majority of cases are persons of good digestion and without fever, the creasote cases are a highly selected class in whom the percentage of results will naturally be higher than the average.

However, creasote is occasionally very valuable for certain symptoms in the tuberculous as in other invalids, and it often confers the mental benefit which patients generally derive from any definite and systematic treatment upon which they can anchor their hopes, and which gives them a reason for being watched by a physician.

Space will not allow of discussing separately the numerous antiseptics that are still used, and for which are claimed curative properties in the treatment of tuberculosis. Of these cinnamic acid, oil of cloves, and peppermint, are among the most recent. Most of these remedies are administered hypodermically, by which method, no doubt, the influence of the drug, whatever it may be, is brought to bear more surely and directly upon the blood than by any other means. But, granting better results by hypodermic injections, it is only fair to bear in mind the increase of the mental impression that is brought about by this definite and mechanical and more or less unpleasant form of medication, and to consider how far this may influence results.

Non-specific Treatment by Drugs.

With respect to the drugs used in the treatment of tuberculosis other than those for which specific action is claimed, they may be divided into two classes: those which are exhibited for their presumed beneficial effect upon the general condition, and those given to combat special symptoms.

As anæmia is usually more or less present in tuberculosis, iron, arsenic, and quinine are commonly of benefit as blood-tonics, and of these arsenic is especially popular, and, in the writer's opinion, deservedly so. Whether this favorable regard is mainly due to the general alterative action of the drug, and to its reputed selective affinity for the pulmonary tissues, can only be surmised; but the writer believes that, where anæmia is present, with or without pyrexia, or if breaking down is going on, or when fibrosis is a danger, arsenic is especially valuable. Where hectic fever exists, a pill of arsenous acid, gr. $\frac{1}{50}$ to $\frac{1}{20}$, with ferrum pyrophosphate gr. ij and strychnine sulphate gr. $\frac{1}{40}$ to $\frac{1}{15}$, in pill or capsule, t. i. d. p. c., has appeared to do good service: both the arsenic and the strychnine being administered at first in small doses and then cautiously increased. Quinine in 2-grain doses for appetite is generally better given before the meal, or, instead, one of the pleasant preparations of calisaya, with which may be com-

bined either an alkali or an acid according as the digestion is unduly acid or alkaline. In cases of defective digestion it is often best to give the arsenic before the meals with an alkali and calisaya, in which case one or two minims of Fowler's solution appears to act as a gentle stimulant to the gastric membrane, and the after-dinner pill is postponed till the digestion is restored. Quinine is also often useful in variable doses from 5 to 20 grains to limit fever, being then given some hours before the afternoon rise.

As has already been said, there is in the majority of cases of pulmonary tuberculosis more or less depression or irregularity of the nervous system, and there is no doubt that strychnine or nux vomica given in increasing doses to the point of tolerance vies with arsenic for the first place in the list of drugs useful in phthisis. When strychnine, or preferably nux, is given for appetite, it is taken with most advantage in a small dose before meals, but if it is used only as a nerve-tonic, and in large doses, it is best borne after meals. In cases where the tone of the nervous system is depressed—and they are very common among consumptives—there is usually no nerve-tonic equal to strychnine, and the writer fully endorses its use as prescribed by Dr. T. J. Mays, who writes thus:

"Begin with a moderately small dose of the drug, gr. $\frac{1}{30}$, four times a day; give this for one week, then increase it to gr. $\frac{1}{24}$ for another week; during the next give gr. $\frac{1}{20}$; the following week raise the dose to about gr. $\frac{1}{16}$; and so on, making a slight increase every week until you observe nervousness, restlessness, or twitching of the muscles—the signs of the beginning of strychnine-intoxication. In most cases these symptoms do not develop until gr. $\frac{1}{12}$ or $\frac{1}{8}$, or even a larger dose, is reached. It must be understood that the drug is to be given in these doses four or even five times a day. The object is to impress the nervous system with the full stimulant effect of this drug. The sooner this end is attained the better will it be for the patient. For this reason you begin with small doses and work upward as rapidly as you can with safety. After the desired point has been reached the question arises whether it is better to continue the largest dose or to resume the original. I think it best not to vary from this line during the remainder of the treatment, for you do not wish to lose what has been accomplished. Keep the strychnine-treatment up to the highest level of safety, but shun the point where the stimulus extends into the region of tetanus and of paralysis. It is best, however, to reduce the dose somewhat at this point. If, for example, it is found that gr. $\frac{1}{8}$ is a maximum dose reduce to gr. $\frac{1}{16}$, gradually increase the dose again until gr. $\frac{1}{8}$ is reached, and then return to gr. $\frac{1}{16}$ or $\frac{1}{12}$. After you have increased and decreased the dose several times, you will probably find that gr. $\frac{1}{8}$ no longer produces any dangerous

symptoms, and that you now can give as much as gr. $\frac{1}{6}$. When administered in this way the drug may be given for an indefinite period to the majority of phthisical patients.

"The remedial effects of the drug show themselves in various ways. The nervousness, sleeplessness, and pain in the chest will be ameliorated and perhaps entirely disappear; the cough, expectoration, and dyspnea will diminish; vomiting will abate; the appetite improves; the patient gains in flesh and color; the weak and rapid acting of the heart will become slower and stronger; the red corpuscles increase in number, and the patient becomes more hopeful and brighter."[1]

Zinc and phosphorus are also of service, especially the former, when night-sweats occur. Gold and manganese, when given hypodermically, are highly recommended,[2] but the writer has not been favorably impressed by his experience of this treatment.

In considering the drugs serviceable in the relief of special symptoms, we can only glance at them briefly.

Cough.—The dry, hacking cough which usually appears in the stage of tuberculization, being useless and generally caused by the nervous irritability of weakness, is best cured by nerve-tonics, with as little sedative as possible; codeia is generally the most satisfactory sedative, and this, if possible, should be reserved for bed-time, given in doses from gr. $\frac{1}{4}$ to gr. j. When the secretion is scanty Dover's powder gr. v–x can be substituted. Demulcent lozenges, etc., in moderation, may suffice during the day. The character of the cough sometimes shows its origin to be in the upper air-passages, especially in hypertrophy of the various tonsils, and then local treatment may remove it. The numerous causes of and remedies for cough are admirably discussed by Dr. Beverley Robinson.[3] The cough which is accompanied by expectoration should be treated as little as possible, unless it exhausts the patient or interferes with eating or sleeping, when stimulating expectorants are of service. It has been pointed out by Dr. C. T. Williams that aromatic spirits of ammonia in drachm doses given early in the morning will assist the difficult and prolonged expectoration from cavities and enlarged bronchi. It is often of great service for the patient to lie over in the position that is found to best favor expectoration, and to cough freely before sleeping and on rising. Hot milk or soup taken at these times is also an aid.

Fever.—The specific use of drugs for the amelioration of this symptom should be very limited and temporary, which means that

[1] *Journal of the American Medical Association*, Oct. 10, 1896.

[2] See J. Blake White, and Shurly and Gibbes.

[3] *Trans. of the American Climatological Association* for 1896.

the underlying causes ought to be attacked and direct treatment by drugs left alone or used only in emergencies.

"The Rôle of Fever" is the title of an admirable paper by Dr. H. A. Hare[1] in which he argues that it is primarily a beneficent process, and he gives the rational basis from which to treat it.

When general treatment by tonics, rest, food, bathing, and fresh air fails to bring the temperature of the patient down so that it is no longer a distress to him, or before their influence is fully felt, one or other of the coal-tar antipyretics can be used beneficially, if guarded by caffeine or quinine (gr. i–ij), for a few days or weeks but rarely longer. These drugs should be given two to four hours before the maximum rise, when a small dose will generally suffice and depression be avoided. In this way the patient is often enabled to eat and rest better and so gain strength, and time is afforded for the general treatment to become efficient, after which it is best to drop these direct remedies. There is, however, one drug whose influence on temperature, when given in large doses, appears to be specific, and which can be used for a prolonged period with benefit in certain cases where the pyrexia is persistent; and that is alcohol, whose effects will be discussed farther on.

Dyspepsia.—The experiments that are reported by Dr. E. M. Skeritt in the *Year-book of Treatment* for 1896, p. 60, throw some light upon the causes of dyspepsia, and particularly upon loss of appetite, in consumptives. A *post-mortem* testing of the pancreatic juice showed that its fermentative power was reduced, in 50 per cent., below that of the juice found in healthy persons who had died suddenly. The gastric ferments were not investigated.

The saliva of living consumptives was tested and found to be markedly deficient in 50 per cent. of the cases. For these reasons Dr. Skeritt doubts the advisability of stimulating the digestion, and prefers to give digested foods or acids, such as malt extracts. In noticing this he mentions the investigations which have been made upon atrophy of the gastric glands. The writer believes that practically the point is a good one, and should be recognized when stimulation fails to have a good effect.

Diarrhœa.—The treatment for this complication is very clearly given in Vol. I. of this SYSTEM (page 921). The writer's experience has been that in diarrhœa, especially when due to tuberculosis of the intestines, a large dose of bismuth subnitrate, gr. xx–lx, given before each meal, in combination with salicin gr. v–x, is generally the best remedy. To this may require to be added an opiate at night, such as Dover's powder gr. iv–viij or chlorodyne ♏x–xxv. When the stools are offensive creasote gr. iij given in the form of

[1] *Therapeutic Gazette*, February 15, 1896 p. 98.

an enteric pill two hours after meals is often of service. In some cases of chronic diarrhœa arising in the course of tuberculosis, especially when dysenteric in character, instead of these remedies success often attends the administration of liquor arsenicalis ℥ij, tinctura opii deodorata ℥ij–v, in water before meals. Sometimes when the diarrhœa is dependent on ulceration in the rectum, cauterization of the ulcers will assist a cure.

Vomiting.—In addition to the advice given by Dr. Cohen, attention may be called to the importance of encouraging or diminishing expectoration in such a way, as regards the time of its occurrence, that the cough does not interfere with meals. This can be brought about by the judicious use of sedatives or expectorants, or provoking the expulsion of the sputa by having the patient lie down, in the position in which he coughs and expectorates most readily, an hour or more before food is taken. When the coughing is reflex with but little expectoration a previous dose of a sedative, such as codeia gr. $\frac{1}{8}$ with ingluvin gr. v, after the meal, is often the best treatment. The character of the meal should be simple and digestible.

Hæmoptysis.—Opinions differ greatly upon the correct treatment for hæmoptysis. Valuable light was thrown on this subject by a discussion held at the last meeting of the American Climatological Association, May, 1896, and in the *Transactions* for that year will be found a summary of the views upon this subject held by the leading physicians of New York, Philadelphia, Boston, Chicago, and Colorado Springs.

Rest, both mental and bodily, was almost unanimously recommended, and the administration of opium in some form or other was shown to be about equally popular. Ice was, perhaps, the next favorite on the list. Saline cathartics then followed, after which came ergot, and next astringents. The ligation of the limbs and counter-irritation found a few advocates. The general conclusions to be gathered from this consensus of opinion were that the use of ergot was declining, apparently chiefly on theoretical grounds, and there was exhibited, on the whole, a scepticism concerning the value of all drugs in hæmoptysis except opium. As setting forth the writer's own views on this subject some of his remarks in the above-mentioned discussion will be quoted:

"The fact is, we are in an unfortunate position about the treatment of hæmoptysis. Our practice must be almost purely empirical, because we are ignorant of the physiological action of the pulmonary circulation and the direct influence of drugs upon it. The observations that have been made by physiologists are as yet incomplete. Dr. Bradford has made the best researches upon the subject. When the blood-pressure is raised in the aorta, is it also raised in the pul-

monary artery? We do not know. The question is still unsettled. So I do not think we are in a position to decide about the relative value of remedies upon theoretical grounds. As the facts are unknown, we can only use our practical experience in the treatment of pulmonary hæmorrhage.

"We are all agreed upon the importance, in serious hæmoptysis, of rest in bed, rest to the chest by strapping, and rest to the system by opiates; these are the first essentials of treatment, to which may be added another, alluded to by previous speakers, that of quieting the nervous agitation of the patient. The nervous phenomena connected with hæmoptysis are very marked, particularly the mental. Next, we all probably rightly attach a certain secondary value to such treatment as stimulating applications over the liver or mustard-baths to the feet, and to purgation.

"In estimating the effect of our remedies in the treatment of hæmoptysis we often do not know when we do good and when we do not, because most hæmorrhages tend to stop of their own accord, without intervention of the physician and the application of remedies.

"Cases of hæmoptysis may be divided broadly, as has been said, into those which are the result of congestion and capillary bleeding, and those which arise from erosions of arteries. Each, theoretically and practically, requires a difference in treatment, and I believe our success largely depends on our diagnosis of these conditions.

"The first great danger in profuse hæmorrhage from a large vessel is the drowning-out of the patient by the blood, and if the physician arrives early it is advisable to turn the sufferer in such a position that the blood can flow readily out of the mouth; to lay him down on the back in bed is to adopt the worst possible position when he is bleeding freely.

"As regards the application of ice to the heart, I am inclined to think that it is often beneficial. It seems to quiet the organ, and thus assist in checking the hæmorrhage. I am sceptical about the value of astringents, such as tannic and gallic acids, nor have I been satisfied with the effect of large doses of lead, as recommended by Williams.

"My clinical experience has been favorable to the use of ergot in large doses, given subcutaneously, at intervals of four to six hours in the twenty-four. I have in mind several cases of very severe hæmorrhages from large cavities, which were bleeding profusely until I used ergot subcutaneously, giving no other remedy. I believe a common cause of failure with ergot is its irregular and insufficient use and its administration through the mouth. Given under the skin, at regular intervals and in full doses, I consider it of great efficacy in arresting hæmoptysis, particularly if this be due to an eroded vessel, and in

the majority of cases I judge it superior to other remedies. There are, however, some cases in which ergot is absolutely useless. What the conditions are which account for this is mere speculation.

"I also regard atropine as an extremely valuable remedy in serious cases, particularly in those in which ergot has proved a failure. But it must be given hypodermically in large doses, such as $\frac{1}{50}$ of a grain. A small dose of atropine is not beneficial. Thus, morphine is best given without the usual $\frac{1}{150}$ of atropine. It is stated that small doses of atropine raise the blood-pressure, while large doses lower it. The reason that atropine is often successful in cases in which ergot is a failure may be that in certain conditions lowering the blood-pressure, as by large doses of atropine, is essential to success, though in certain other conditions raising the pressure is no detriment, or not sufficient to offset the other beneficial qualities of ergot.

"Opium in some form should always be given, as well as other suitable remedies, when it is desired to arrest the hæmorrhage and check cough. But there are cases of congestion in which it is unwise to do this.

"The immediate danger of suffocation and the risk of a subsequent pneumonia are the most important considerations in the treatment of severe hæmoptysis."

Tubercular Laryngitis.

Tubercular laryngitis is always a serious disease, and is almost invariably associated with pulmonary tuberculosis. Its presence appears to indicate a tendency to free dissemination of tubercle with but little tendency to self-limitation. While the disease may undoubtedly arise from local inoculation of an abraded laryngeal membrane, yet clinical and theoretical considerations make it probable that it usually arises from an extension from the lungs or glandular structures of the throat or thorax. The cases of spontaneous cure of this affection are extremely few, especially of the ulcerative form. Fortunately judicious local treatment can do much to mitigate, and it occasionally cures, the disease, and, although the patient may succumb to the tuberculosis in other organs, yet topical measures will sometimes arrest the progress of the laryngeal disease, so as to save the patient from a distressing death through an advancing tubercular laryngitis.

The first essential of the treatment is attention to what may be termed the toilet of the throat—that is, the cleansing and washing of the membrane with an antiseptic alkaline spray, such as Dobell's solution, and if necessary the use of a cotton swab, cocaine being first applied. Sedative and curative effects are best produced by stimulating, and sometimes by methods which are apparently harsh. The

condition is usually an anæmic one, and the congestion is chronic in character. The stimulation may range from that of a weak solution of nitrate of silver, ichthyol, or menthol, to cauterization with lactic acid or the scraping of the ulcerated surfaces with a single curette or even the excision of tubercular masses with the double curette as used by Krause or Heryng.

The submucous injection of creasote or lactic acid into tubercular swellings with the automatic syringe referred to under the head of Intra-laryngeal Injections is also of marked benefit. Iodoform mixed into a paste with glycerin may be applied on cotton to ulcerations after cauterization or scraping. A weak cocaine spray should be used before the introduction of instruments into the larynx. When the treatment is likely to be painful, a 20 per cent. solution of cocaine should first be applied to the parts; pain at other times is best relieved by a 10 per cent. solution of antipyrin mixed with an equal quantity of a 4 per cent. solution of cocaine.

Alcohol.

Alcohol has been extensively used and abused in the treatment of tuberculosis, and physicians are frequently to blame either in denying its merits altogether or in prescribing it carelessly. As a routine practice the recommendation of alcohol in phthisis is to be condemned, and there is a large proportion of cases in which its use is harmful, or in which it should at least be only temporary. While much remains to be done in the study of the physiological and pathological effects of alcohol, these facts may be considered as established, viz. that moderate doses of alcohol act as a stimulant, improve the appetite and digestion, and increase weight, while large (not extreme) doses act as a sedative and antipyretic, idiosyncrasy modifying these phenomena very considerably. Persons of a nervous temperament or a full habit do not tolerate alcohol so well as those who are phlegmatic or thin-blooded. The taking of extra doses of alcohol or its prolonged free use leads to fibroid change and its consequent phenomena. The records of autopsies of chronic alcoholics appear to show that the fibrosis induced often arrests pulmonary tuberculosis, though it may have been disastrous in other directions.

Alcohol in any form is frequently prejudicial in the treatment of tuberculosis, particularly in women or in those who are in the habit of abusing it either continuously or temporarily. If the patient has been previously accustomed to its moderate use this may generally be continued with advantage, or, if he does not seem to respond to other treatment as readily as he should, alcohol may be cautiously tried. In some cases from a half to two tablespoonfuls of whiskey, with a bitter and in water, immediately before meals will start up an appe-

tite; when this has been effected it is best either to omit the alcohol or to give it after instead of before the meal. At lunch and dinner it is often best borne in the form of wine or beer taken with the meal and it should not be taken at breakfast-time. When there is a weak heart and but little food can be digested at a time, alcohol is often administered with more benefit between the regular meals, but it should always be accompanied by some slight nourishment, as in the form of a milk-punch an hour before breakfast, or an eggnog, an egg-oyster, or a glass of wine or of whiskey and water with a biscuit between meals, at bed-time, or during the night. The administration of a moderate amount of alcohol divided into four or five doses and spread over the twenty-four hours as indicated, appears to act as a heart-tonic. When fever is distressing and prevails in spite of general treatment, the writer has found the administration of large amounts of alcohol, continued sometimes for three or four months, of great assistance in helping patients over a period of excavation, or for a shorter time, during a slowly advancing tuberculization accompanied by fever. As in all cases, but especially when alcohol is given, the urine must from time to time be tested and its quality estimated, while the nervous, hepatic, and digestive functions are watched. The initial doses should be small, and be cautiously and gradually increased to the point of tolerance. Alcohol used in these ways does not induce a habit, and when the need for it disappears, there generally arises rather a distaste for it. The danger is not in taking it according to rule, but in "nipping" on an empty stomach, in following inclination, or in using it to procure a ready stimulus before undertaking some unwise exertion.

The exhibition of large doses of alcohol with the view of directly procuring fibrosis around the tuberculous foci is most unquestionably dangerous, as there is every reason to believe that the same amount of fibrosis will occur coincidently in other organs, and kidney and liver disease be induced, or at least a troublesome and depressing lithæmia established. On the other hand, the presence of a mild gouty habit, either previously existing or created by the continued use of alcohol, if it does not interfere with the general health, appears to tend toward arrest of the tuberculosis, perhaps by moderately increasing the fibrosis. The form and amount of the alcoholic beverages used must depend upon individual tastes and tendencies; the race and habits of the patient have much to do with the choice.

Alcohol administered at bed-time, especially a malt liquor, will often induce sleep, and a little whiskey and water taken with a small biscuit when lying awake during the night, will have the same effect.

Food.

Unquestionably the quality and quantity of the food supplied to tuberculous patients is of the utmost importance. This subject is so fully and excellently treated of, both practically and theoretically, in Dr. Cohen's article in Vol. I. of this System that the writer has but little to add. It is undoubtedly true that for the majority of tuberculous patients animal food should be the principal and in some instances almost the only article of diet, but the individual as well as the disease is to be considered, also the desirability of interesting the patient in his food by reasonable variety.

Milk is a valuable food for the consumptive, and if possible should be included in his dietary; but harm is often done by giving it in excess, particularly with a full meal, for it is digested with difficulty by certain so-called bilious patients. These persons can, however, often take hot milk if the cream is first removed, then lime-water, soda, or salt added, and it is heated without boiling, and given on an empty stomach an hour before a meal. Sometimes it is better to dilute the milk with an equal quantity of a pleasant alkaline effervescing carbonated water, such as Apollinaris or Manitou; or it may be necessary to peptonize it or give it in the form of buttermilk or koumyss. It is also often a good plan where coffee is not contraindicated to allow a small amount of strong coffee to flavor a bowl of hot milk at breakfast-time. Tea made with hot milk was a favorite recipe of the late Sir Andrew Clark. Milk is better digested if the oil-globules are first broken up as in a milk-shake. Cream apart from the milk and added to other articles of food or drunk alone, or flavored with a glass of Maraschino, is an attractive and nourishing beverage to some patients. Milk-punches are also useful, but not always easy of digestion.

Eggs swallowed whole and taken on an empty stomach an hour before meals are rapidly digested and stimulate rather than diminish the appetite. Cooked eggs are much slower of digestion than raw, but if digested are valuable articles of diet. Some patients cannot, however, digest the yolk, in which case the white, uncooked, should be taken alone or added to other food.

Beef is generally thought in this country to be more nourishing than mutton, and this is true of most of the mutton obtained in America, but in England, where the sheep are raised for food as well as for wool, mutton is undoubtedly the equal of beef in food-value and digestibility. When the patient is weak and with poor digestion it is always advisable to give food before rising in the morning, in the middle of the forenoon and afternoon, on going to bed, and sometimes during the night. In some cases of slow and feeble diges-

tion it is best to give hot milk without other food an hour before each meal and not less than two hours after the meal preceding, or, if milk proves too heavy, hot water must be substituted for a time at least. Fresh meat-juices or one of the good bottled preparations, or raw scraped meat in the form of sandwiches or small meat-cakes, make valuable intermediate meals. It is not a rare thing to overfeed consumptive patients and produce temporary albuminuria. The tongue, urine, and stools of the patient must be noted in those who are undergoing the valuable remedy of forced feeding. Oils and fats, while often desirable as foods, are not always well borne. Cod-liver oil, though a valuable food for some patients, is by no means a specific, but should always be tried in cases where there is waste. The writer has not been impressed with the value of the extracts of cod-liver oil, nor with its inunction.

Intra-laryngeal Injections.

Intra-laryngeal injections have been used with apparent success in the treatment of phthisis and particularly of hæmoptysis. Dr. Colin Campbell reported to the Royal Medico-Chirurgical Society of London[1] favorable results in the treatment of 25 cases. In the subsequent discussion Drs. J. K. Fowler, Mitchell Bruce, K. McLeod, and Routh indorsed this method, while Dr. C. T. Williams condemned it.

Dr. J. L. Barton reports[2] favorable results in 10 cases, and quotes Drs. Horace Green, Bergeron, Pernice, and J. Muir as sanctioning the treatment.

The procedure is to inject with a special syringe 1 to 2 drachms of an antiseptic fluid into the tracheal tube, the nozzle being passed rapidly below the cords and the fluid quickly discharged during inspiration, this being repeated if necessary. The preferable liquid is a 10 per cent. solution of menthol in pure glycerin. For hæmoptysis turpentine is used. The syringe is best fitted with a spring which is released so that the contents are automatically discharged with the least possible friction and effort, and thus the point is not apt to be driven against the walls. The syringe designed by Dr. W. F. Chapell (Tiemann) primarily for submucous injections and modified by the writer fulfils these requirements most satisfactorily. This treatment has had excellent results in lessening expectoration, fœtor, and cough. The objections to the method are, first, the necessity that the operator should have the required skill, and secondly, that the patient should possess a larynx not over-sensitive. The writer has found that the beneficial local effects of antiseptic and stimulating drugs upon the mucous membrane of the trachea and bronchi can be brought about

[1] *British Medical Journal*, 1894, vol. xi. p. 1238.
[2] *New York Medical Record*, August 1, 1896.

more easily and satisfactorily by the use of inhalations after the method described in the following paragraph.

Inhalations.

Most of the inhalers are little more than toys, but if the globe inhaler is used with a large amount of air compressed to not less than 10 lb., and preferably 20 to 30 lb., even so heavy a fluid as compound tincture of benzoin with equal parts of alcohol and glycerin can be vaporized and inhaled in suitable cases with the very best effects. The difficulty in procuring satisfactory inhalations is in getting a sufficient amount of compressed air to maintain the vaporization for fifteen or twenty minutes with force enough to vaporize a gummy solution. The hand-pumps for the purpose of air-compression are all more or less unsatisfactory and hard to work. The best plan is to compress the air with a pump worked by the water-pressure, when there is pressure of 10 lb. or upward in the city water-pipes. A good supply of compressed air is specially needed in using so heavy a fluid as the one named, and the writer's experience has been that the effects are much more marked and lasting when the solution is of such a character. While it is more difficult to volatilize on account of its gummy nature, yet for this very reason it remains longer in contact with the mucous membrane and its effects are more permanent than those of lighter fluids; but when the respiratory tract is especially irritable, or if there is a tendency to hæmorrhage, lighter and less stimulating liquids must be used.

The globe inhaler should have an outlet at the bottom connected with a bottle into which the surplus liquid can drain. This renders the globe much more easy to cleanse. After the use of benzoin it is best to spray out the globe with alcohol to cleanse it and to dissolve the adherent gum, and to wipe the mouth-piece inside and out with cotton soaked in alcohol. The patient should be instructed to inhale through his mouth and exhale through his nostrils, and if he is obliged to cough he should first withdraw his mouth from the inhaler.

It is not believed that any form of inhalation can be safely used to kill the bacilli, nor can inhalations directly open up consolidated areas, but the writer's experience strongly favors the belief that it is an efficient means of relieving cough and expectoration, ventilating cavities, and diminishing the number of streptococci and similar micro-organisms. It is probable that only a small amount of the drugs is absorbed into the tissues, and that the beneficial results are mainly due to their direct effect upon the surface of the respiratory tract, and to the pulmonary exercise of deep inhaling.

In giving inhalations it is very important that the patient should

at first be watched and instructed in regard to the method of breathing, so as to make each inspiration as slow, distinct, and prolonged as possible. By this means the greatest amount of vapor is inhaled and the benefit of deep and full respiratory exercises is received; but it is advisable for the patient to begin with only a few inhalations and cautiously increase their depth. It is, moreover, wise to warn a patient at first to take only two or three inhalations at a time, to rest a few moments and then repeat the same number, taking perhaps twenty inhalations in all. Then, each day he may add three more inhalations until a total of, say, sixty is reached: he must at the same time gradually increase the number of inhalations, resting between the intervals from three to six. The objection made to such a method is that the medication is carried into the healthy and not into the diseased lung; and this is undoubtedly true as regards the diseased air-cells which are occluded, but it is not the case as regards the open tubes or cavities, the vapor being distributed equally through the ramifications of the bronchi in both lungs. Moreover there does not appear to be any injurious effect upon the healthy membrane, through which doubtless a certain amount of absorption takes place. However, it is probable that the chief benefit is derived from the cleansing and stimulating of the bronchial tubes, and from the deep breathing exercises. This treatment should be carried out every day for several weeks until the cough and expectoration become moderate. It requires a little patience and perseverance to overcome the increased cough which is often at first provoked by the inhalations; in such cases it is sometimes advisable to spray the fauces with a weak solution of cocaine before inhaling, until tolerance is established. This treatment is also of benefit in laryngeal and naso-pharyngeal complications. Steam inhalations should only be used in acute and inflammatory conditions, and are positively harmful in chronic tubercular diseases. It is probable that at sea-level inhalations are more efficient when given in connection with treatment in the pneumatic cabinet.

Sprays.

Sprays, except for the direct treatment of the upper air-passages, are useless, because the spray condenses on the walls before it reaches the trachea, and thus the effect is lost beyond the larynx.

Massage, Gymnastics, and Exercise.

The regulation of the exercise is of the utmost importance. Where there is fever or much weakness the exercise should be extremely limited, and sometimes entirely interdicted and massage substituted for it. The writer has seen the greatest benefit derived from massage in suitable cases, and it is to be regretted that the small

attendant inconvenience and expense prevent many patients, whose condition is suitable, from making use of it. In the beginning it should always be used extremely lightly, so that the patient is not unduly fatigued. The majority of masseurs begin too violently, and they are also not always sufficiently careful about protecting their delicate patients from becoming chilled. During the first week or ten days of treatment by massage the fever may be slightly increased and the weight decreased, but later the reverse commonly holds true, and the appetite and general vigor usually improve. The treatment for those who are weak should be given only every other day the first week, after which it may be used with advantage daily for some six weeks; by this time Swedish movements can with safety be substituted for the massage, beginning with the passive and proceeding to the resisting movements. The treatment may be continued for about a month, by which time the patient should be sufficiently strengthened and prepared to use certain moderate gymnastic exercises for himself and begin a more active life out of doors; for instance, he may then be ready for the bicycle, a valuable therapeutic agent in the cure of tuberculosis. The bicycle saddle should permit only of pressure upon the tuberosities of the ischium, and the patient must be warned against fast or long rides as well as against riding in the face of a high wind, or through heavy sand, or up-hill; in fact, the bicycle ought only to be used under the direction of the physician, as heart-strain is not an uncommon result of imprudence.

Horseback riding if begun in the same moderate and cautious way is of still greater value to many consumptives.

Driving in a carriage or riding in electric cars is often beneficial if the patient is sufficiently protected against chill.

Walking, if not too fast or prolonged, is a valuable exercise, as is also the slow climbing of hills. The game of golf, when indulged in without too much excitement, is an admirable method for procuring the advantages of a walk with moderate use of the arms, and moreover it keeps the patient out in the open country a longer time than most people would otherwise find interesting. But in all these games and sports consumptives should especially avoid undue excitement, under the influence of which they are apt to respond to calls for sudden and violent exertion, such as is often required in a match at lawn tennis, which, however, is a good game for convalescents or slightly affected cases, if played with moderation.

One of the difficulties of conducting a case of tuberculosis to a satisfactory conclusion is that when the patient is sufficiently well to take exercise he is apt to think that he does not need his physician's advice, and so, frequently, exercises too much or too little. The same is true in a measure with regard to amusement, which in some form

is generally a necessary element of successful treatment, but which the physician is seldom allowed to control.

It is of the utmost importance to the patient that his daily life in all its aspects should be directed by a physician, and it is the practicability of such supervision that gives to sanitarium treatment its special value.

Bathing.

The cleanliness and activity of the skin are of great importance in cases of pulmonary tuberculosis, and the judicious use of hot and cold water is also of great service in stimulating the healthy functions of the nervous and circulatory systems; it is probable that it is mainly for the same reasons that cold bathing does good in cases of typhoid. As a rule the bathing should be in either hot or cold water rather than in warm. Where the accommodations admit of taking a hot tub-bath and the free use of soap, followed first by cold douching with a sponge while the patient is still standing in the hot water, and then brisk rubbing, the writer has obtained the very best results in producing a beneficial and pleasant shock and in preventing cold-catching. Where the patient is delicate these baths should not be taken oftener then every other day. Shower, needle, and massage baths are also beneficial in certain cases. An alcohol rub after the bath sometimes adds to its efficacy.

Clothing.

I have little to add to what Dr. Cohen has previously said, except to reiterate the importance of wearing wool or silk next to the skin, both day and night, a change being made between the day- and night-clothing, and that the clothing of the patient, and especially his foot-wear, should claim the attention of his physician.

Sanitarium Treatment.

Unfortunately, much prejudice exists against the use of sanitariums by consumptives. There is no class of invalids which stands in greater need of them, nor any patients in whom better results are obtained from their proper use. The reasons for the prejudice felt against sanitariums are many, among them the dread of infection from other cases, which is a groundless fear if the sanitarium is what it should be; good sanitaria are far better ventilated and cleaner than most lodging-places, and statistics of the excellent health of their staffs corroborate this statement.

Sanitariums are, moreover, not generally in good repute, because the regular profession have paid too little attention to the supervision of the rest, exercise, food, lodging, clothing, etc., of their patients, and have been in the habit of leaving these details largely in the

hands of mercenary, unscrupulous, or ignorant persons, while they themselves have only considered the diagnosis and prognosis of the case and its treatment by drugs. Sanitariums should have not only a competent superintendent, but also a visiting staff as has a hospital.

Another difficulty to be overcome in inducing consumptives to enter sanitariums is the old idea which still lingers in the minds of many laymen and doctors that tuberculosis is always and absolutely a hopeless disease. On this account many patients object to being marked as consumptives, herded together and isolated in an establishment with those about to die. One of the drawbacks of bringing patients together is their common tendency to talk about and dwell upon their physical condition. This, however, can be largely overcome by a wise superintendent. The benefits derived from sanitarium life are thus both direct and indirect, and patients who have been in good sanitariums are usually much more intelligent in taking care of themselves after they come out.

Well-equipped sanitariums should possess means for giving massage, gymnastics, etc., as well as for different forms of bathing, rooms for entertainments and porches having varied aspects with wind and sun shelters where needed. Adjacent cottages are best for use in fairly robust cases and for families, but the heating, ventilating, and plumbing are more expensive and not so easily managed, and therefore cottages are not so well adapted for those who are seriously affected. The grounds should have walks and shelters, golf links, croquet and bowling lawns. Gardening is a pursuit of great service to convalescents. The argument in favor of sanitariums is admirably put by Dr. E. O. Otis in an article on "The Sanitarium or Close Treatment of Phthisis."[1]

In Germany the Red Cross hospitals built during the Franco-Prussian War are now being utilized as sanitariums for the poor. The practical economy of placing wage-earners, and those who carry life-insurance, in sanitariums as soon as possible after tuberculosis has developed is shown by the experience of the Hanseatic Association (an insurance society for sickness and old age). The managers report that of 226 tubercular persons sent by them to a sanitarium 155 were able to resume their occupations, and they said that if only 29.2 per cent. are able to go back and work for even one year the amount of payments thus saved covers all expense.[2]

The writer's article on Climate in Vol. I. of this SYSTEM contains some statistics and arguments in favor of sanitariums, as also does his

[1] *N. Y. Medical Journal*, June 13, 1896.

[2] This and other instances of the same economy are given in an article in the *Deutsche med. Wochenschrift*, Sept. 3, 1896, quoted by the *Journal of the American Medical Association*, Nov. 7, 1896, p. 1026.

Handbook of Medical Climatology; and further, his practical experience with sanitariums in Colorado Springs is entirely favorable to sanitarium treatment.

Fresh Air.

Out-door air is of the greatest necessity to tuberculous persons, and no cure can be established unless the patient leads an out-door life. This is true even when the air breathed is not of the best, as in crowded cities or in bad climates, but some patients whose condition is weak, who have a susceptibility to cold, or who lack a place to rest in out of doors, have to make in-doors as much out of doors as possible; that is, they must have their windows and shutters open and lie or sit during the day in the sun and air near the windows, even if it be necessary to wear their caps and overcoats. At night they should still keep their windows open, but if the air is too cold or if there is much wind a thin canvas screen should be inserted below the sash. If the air is damp the room ought to be artificially heated, preferably by an open fire. The temperature of the air in the room should be low while the patient is in bed, but warm, 65° to 70° F., while he is bathing and dressing. The principle is to breathe cold air, but to protect the surface of the body against a chill. The air of a room which is heated either artificially or by the sun and properly ventilated is always drier than is the air outside, especially in moist climates. Those invalids to whom, on account of their catarrhal tendencies, damp cold air is obnoxious had best stay in-doors on chilly damp days, especially if they are not strong enough to keep warm by exercising. The practice of keeping windows open and living much out of doors, however, soon hardens the majority of invalids, so that there is little danger of catching cold. Next in value to the openness of the air is its purity, upon which subject the following quotation from the writer's work on Climatology is pertinent:

"The experiments of Brown-Séquard, Stokes, Trudeau, and others show that when animals which have been successfully inoculated with bacillary matter are kept in confined spaces with imperfect ventilation they become tuberculous, while those which, after similar inoculations, are kept in open-air quarters escape the disease. This goes to prove that the presence of pure air not only makes infection from the bacilli less likely, but that even when they are received through inoculation or otherwise it aids the body's natural resistance and promotes recovery. Therefore, the first essential of a climate for a consumptive is pure air, because it assists to a cure and lessens the dangers from infection." [1]

Thus the first thing is to give the tuberculous person as much and as pure air as his environment permits.

[1] *Handbook of Medical Climatology*, by S. E. Solly, M. D. Lea Brothers & Co.

Climate.

Humidity and Temperature.—With respect to the relative value of air in regard to its humidity and temperature I will further quote:

"It is found that, other conditions being equal, consumption is most prevalent in climates in proportion to the temperature and humidity as follows: First come damp cold climates; second, damp hot climates; third, dry hot climates; and fourth, dry cold climates; and, in promoting recovery from consumption, as a broad statement the reverse order holds good. Thus, in a general way, it may be said that dampness is harmful to the consumptive and dryness beneficial, while the relative effects of heat and cold depend upon the humidity. Therefore, in a damp climate, heat, except when tropical, is less harmful than cold; while in a dry climate cold, on the contrary, is more beneficial than heat—that is, to the vital resistance, though not always to the disease.

"Apparently, humidity of the air, apart from other factors, does not in itself produce phthisis. The comparative immunity from consumption among the men of the British navy contrasted with those of the army, and the rarity of the disease in many islands, such as the Faroe, the Shetlands, the Hebrides, and Iceland, show this. The influence of these climates and of sea-voyages on the disease when developed and active has, however, not been shown by the evidence of others nor by my own observation to be advantageous, removal from the sea being generally of most benefit. Where advantage has been derived from a sea climate it would appear probable that it was owing to the great purity of the air or the elimination of unsanitary conditions and hurtful occupations.

"Dryness of the air, on the contrary, is known to be of positive benefit to the consumptive. The excellent results obtained from desert air (apart from great altitudes, which we will consider later) are too well known to quote at length.

"In crediting dryness of air *per se* with a beneficial influence upon phthisis, we must not forget that some share of the credit, at least, belongs to the other necessary accompanying factors of a dry atmosphere, namely, more powerful sunlight and heat, less depressing cloudy weather, cooler nights and shade, and a higher electric tension of the body. What is also of prime importance is the greater opportunity for exercising and resting in the open air, and the free access of fresh air to the house by day and by night while the patient is in-doors."[1]

Range of Temperature.—The evidence collected by Hirsch and others shows that "Severe and sudden changes of temperature

[1] *Handbook of Medical Climatology*, by S. E. Solly, M. D. Lea Brothers & Co

have no more determining influence *per se* than has the absolute height of the temperature." It is further shown, however, that variability if accompanied by dryness is usually beneficial, but variability with dampness is positively harmful.

Wind.—"Consumption is neither more nor less prevalent in a place simply because it is windy, nor are consumptives as a class made better or worse by this element alone. It is beneficial or detrimental according to its temperature and humidity and the patient's condition; that is, according to his need of stimulation or sedation.

"*Cold moist wind* sometimes soothes, but more often depresses the patient, while it aggravates catarrhal affections if they be of a relaxed type.

"*Cold dry wind* simply stimulates or else irritates the patient, and hence it improves relaxed catarrhal conditions, but makes those which are inflammatory worse.

"*Warm moist wind* lessens irritability, and is either soothing or depressing.

"*Warm dry wind* acts as a tonic or increases irritability."[1]

Sunlight is of the greatest benefit in promoting healthy growth, increasing the oxidation of tissue, and pleasantly stimulating the nervous system of the consumptive. Sun heat, if not excessive, has an agreeable sedative influence, is the cheapest and best of germicides, and is especially valuable in inducing delicate invalids to spend more time out of doors than they otherwise would.

Barometric pressure, if markedly decreased as at high altitudes, has been shown to have a powerful influence over anæmia through increasing the amount and quality of the red blood-corpuscles and hæmoglobin, as demonstrated by numerous experiments, notably those of Regnard. It is probable that this hæmatogenetic effect is the chief cause of the marked benefit usually derived from a change to a high altitude by the victims of tuberculosis.

Results of the Climatic Treatment of Phthisis.

In endeavoring to ascertain the definite effects of change of climate upon the progress of phthisis the writer collected all the reports of results of change of climate upon consumptives which he could find at the time of writing his book upon Climatology, and the detailed reports will be found in it. The number of cases reported was over 8000; of these, 7795 admitted of tabulation for the purpose of comparison. It must, of course, be admitted that the material of which the cases are composed is too variable in quality to allow of any close comparison of results, but as the number of cases and of reporters is

[1] *Handbook of Medical Climatology*, by S. E. Solly, M. D. Lea Brothers & Co.

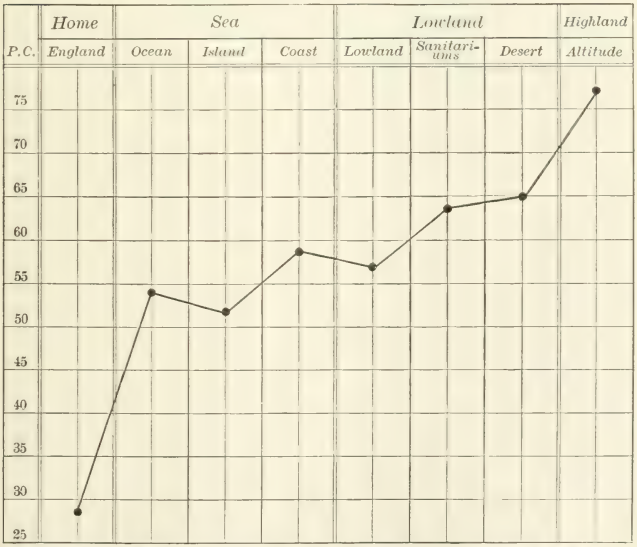
so great the law of averages comes in to help us. "In the use of this law the very widespread diversity of opinions, ability, opportunity, material, and season comes as an aid instead of a hindrance, and enables us to find, in place of nice comparisons, governing principles, and so we gain some insight into the why, wherefore, and whither of these varied and sometimes incongruous statements. It is necessary, therefore, to arrange these reports in groups, in which are given a sufficient number of reports and reporters to equalize the variations and to afford a fair average; thus comparisons can be made which, it is reasonable to believe, indicate in a general way the relative values of the several varieties of climate in the treatment of phthisis.

"The conclusions drawn from the statistics are confirmed or modified by what we may regard as reasonable deductions from our knowledge of the physiological and other influences of climate, and by other statistics which show the geographical distribution of the disease."[1]

"If we extract the percentages of results for all stages of each group and put them in order, progressing from the ocean up to the high altitudes, we see an almost steady rise in the percentage of improvement as we proceed toward the highlands, as illustrated by the chart.

FIG. 1.

Analysis of 7795 Cases of Phthisis.



[1] *Handbook of Medical Climatology*, by S. E. Solly, M. D. Lea Brothers & Co..

"It will be observed that the rise would be uniform were it not that the results from ocean voyages run 2 per cent. higher than those from the sea islands, and that the results from the low inland resorts drop back 2 per cent. below the seacoast climates. As has been before remarked, the selection of the cases sent on sea-voyages is usually more carefully made, and their living more out of doors in a purer air than they would do on shore may account for this slightly better result.

"The total percentage of the low inland results is lowered by those of Rome and Pau, otherwise they probably would not have shown the slight dropping back of 2 per cent. below the Riviera reports. It is very much to be regretted that the physicians of Southern California give no reports, and also that none can be had from Thomasville nor from many other good inland places. The few cases reported from Southern California were not on the coast, or they would have been classed with the Riviera group."

On looking at this chart it will be seen that the two climatic factors which have apparently the greatest effect upon the results are sea and mountain air. The results of treatment in England are inserted under the title of "home climates," as the change of climate for these cases was so slight that the results may be said to illustrate the effect of leaving the patient in the climate in which he acquired the disease. The improvement shown in cases of phthisis of all stages in the sea climates was 57 per cent., in the lowland climates 63 per cent., and in the high climates 76 per cent. This indicates that as the sea influence diminishes the improvement increases. Again, as indicating the superiority of high over low climates, if all the low climates are grouped together it is seen that the percentage of improvement was 59 per cent., while in high climates it is 76 per cent. "This inquiry has clearly demonstrated two things, viz. that the majority of consumptives do better, other things being equal, the farther they are removed from the sea, and that they do better in high than in low altitudes, wherever situated, the difference in proportionate improvement being here exhibited."[1]

It will be noticed that the results reported from the sanitaria are markedly higher than the average of improvement in the open resorts in similar lowland climates. This confirms what has already been said about the value of sanitarium treatment. The reports separated into the different stages—first, second, and third—were too deficient to form the basis of any broad comparisons, yet they show that the reports of the first-stage cases are much better in proportion than those of the combined stages or of the second or third stages; this appears to confirm the common opinion that the majority of incipient

[1] *Handbook of Medical Climatology*, by S. E. Solly, M. D. Lea Brothers & Co.

cases are benefited more or less by any climatic change, as in fact they generally are by *any* change of treatment. The important question as to the relative permanency of the benefit derived in the various climates could not be extracted from the information obtained. The very ease with which early cases are improved by mere climatic change is in itself a source of danger, because as a consequence these patients too often return prematurely to their former environment, thinking themselves cured.

These statistical inquiries undoubtedly show very clearly the general tendency of the influence of climate upon phthisis, and it will be found that most forms of tuberculosis follow the same lines as those of phthisis. There are, of course, certain exceptions where altitude is objectionable and sea air beneficial. It is not possible within the limits of this article to discuss the various forms of phthisis as influenced by climate, but it may be said in a broad general sense that the purely tuberculous cases do best in cool dry climates, and next best in warm dry ones, while inflammatory cases of an erethic type may do best in a warm moist climate and next best in a warm dry one, and catarrhal cases of febrile or irritable character do best in a warm dry atmosphere, but in catarrhal cases which are not inclined to fever or nervous irritability the reverse holds true.

With regard to the elevation, high altitudes are of benefit to the great majority of cases of phthisis, particularly those of a tuberculous type, and in all cases in which anæmia is marked. The chief contra-indications are diseases of the heart, a limited area of healthy lung, advanced fibrosis, marked erethic tendencies, and old age.

Cases Suitable for Climatic Change.

In order to lay down a rational and systematic plan of treatment the tuberculous individual and his circumstances must be duly considered as well as the type and stage of his disease. This is especially true when the matter of change of climate is under consideration. There are many patients to whom, on account of their circumstances, leaving home is a real hardship, and these should not be forced to do so unless home treatment is not succeeding. Of such cases those in which the disease has arisen under peculiarly unfavorable conditions of life may often be safely allowed to remain for a time, at least until the tendencies of the case are clearly indicated, if such conditions can be removed and the environment made hygienic. Some of those in whom the tuberculosis is not advanced or active and whose ill health appears to be due not so much to this as to indigestion or other causes which can be treated at home, may remain if they are carefully watched. Occasionally a change of house, soil, or conditions physical or social, will put the patient on the road to recovery if the

accompanying treatment is judicious. Hereditary cases should always be sent away, and as a rule the change must be permanent. Cases resulting from pneumonia, pleurisy, or bronchial catarrh, which are slow in clearing up should have climatic change, and, where the patient can afford it and domestic ties do not interfere, it is always safer to advise an appropriate change. In doing this the habits and requirements of the patient must be considered, as well as the climate of the resort to which he is to be sent. Before selecting a climate the physician should acquaint himself with the principles of medical climatology as well as with the details of the resorts.

THE PRESENT TREATMENT OF SYPHILIS.

By EDWARD MARTIN, M. D.

When and How should Syphilis be Treated Constitutionally?

In recent years those best versed in syphilology have differed in regard to the best time for beginning the constitutional treatment of syphilis. Doubtless, the weight of authority is in favor of withholding specific treatment until general adenopathy or secondary eruptions on the skin or mucous membrane appear. The reason for thus withholding treatment is either that the diagnosis of syphilis can be established beyond doubt only by adenopathy or the syphilides, or that the disease does not reach that stage in its evolution which is most favorably influenced by the exhibition of specific medicament till symptoms of the secondary period have developed.

It is clear that those who do not believe in giving mercury till the diagnosis of syphilis is absolutely established will, save in exceptional cases, be compelled to wait for the secondary eruption, since it is now universally conceded that the most typical local sore may not be syphilitic in nature, or at least may never be followed by other manifestations of the disease.

In direct opposition to the practice of waiting for a certain diagnosis, there are many who urge that treatment should be inaugurated the moment a probable diagnosis is established. The theoretical reasons for this plan of action seem to me conclusive, and, in so far as practical results are concerned, I believe them to prove that the disease is most certainly, easily, and permanently cured by an active, intelligently directed treatment, begun early and long continued.

It is generally conceded that syphilis is a microbian disease; that it enters the system at one point, multiplies there, and finally involves the entire organism; that its effects are counteracted and its virus weakened and ultimately destroyed by mercury.

These facts being true, it seems difficult to understand what reason there should be for delay in the exhibition of the specific drug after diagnosis is once fully confirmed; hence the treatment should be instituted as soon as a chancre is observed.

The main difficulty lies in deciding whether or not a given sore is

a chancre. I have already said that a positive diagnosis of chancre cannot be made; if, however, a genital sore is single, is of more than fifteen days' incubation, becomes indurated in the course of a week, and produces a typical non-inflammatory polyglandular inguinal enlargement, in at least nine cases out of ten such a sore is a chancre. In a few cases, even under such circumstances, secondaries fail to develop either at the regular time or at a subsequent period, and we have been in the habit of regarding such sores as non-specific. This is not necessarily true. Syphilis inoculated upon a resistant system may produce a chancre and no other lesions. It is, however, undoubtedly true that some few sores may correspond absolutely to the type of chancre, although they are not syphilitic.

The strongest argument against early treatment of syphilis is, then, based on the ground of this uncertainty of diagnosis, since it is held that by beginning treatment at an early stage the development of the secondaries is prevented, or at least always retarded, and that neither the surgeon nor the patient can ever be quite sure that syphilis is really present. It is also maintained that as a result of this early treatment the secondaries are irregular and unusually severe.

It is quite true that the administration of mercury during the primary period will almost certainly delay the secondaries, and will make them atypical, at least in regard to their time of eruption. It is, however, by no means proven that lesions when they do occur are more than ordinarily severe. This assertion is made on entirely insufficient evidence, and, as far as my own experience is concerned, is utterly unfounded. It is only fair to state that this point must be settled by clinical study of a large number of cases extending through both the secondary and tertiary periods of syphilis. Such an adequate study has not yet been recorded.

If the practitioner, following the teaching of many of our most eminent and experienced syphilologists, decides to withhold specific treatment until the diagnosis of syphilis is absolutely corroborated by the appearance of secondary lesions, he will do well not to wait for general adenopathy or the eruption upon the skin or mucous membrane, since these are not the first unmistakable signs of constitutional involvement; but, rather, he will institute from the time syphilis is suspected a series of examinations of the blood. If, without otherwise obvious cause, there is a pronounced decrease in hæmoglobin and a moderate increase in the number of the white corpuscles, this, together with the chancre, is sufficiently indicative of syphilis to justify positive diagnosis, and, since it precedes by one or two weeks the development of other secondaries, enables the practitioner to institute a specific treatment this much earlier. It is worthy of note that this anæmia does not invariably develop; hence when the blood remains

normal it will be necessary to wait for adenopathy, exanthemata, or other characteristic early manifestations of the disease.

I would urge, however, that the constitutional treatment of syphilis be begun the moment a probable diagnosis is formulated. As a result of this practice it is possible that two or three patients in the hundred may receive a prolonged mercurial course although their sores are not specific. In the remainder the disease will be combated practically from its incipiency, and lesions of the secondary or tertiary stage will not develop. This early treatment is a valuable means of confirming the diagnosis, since the rapid disappearance of induration, the healing of ulceration, and the lessening of inguinal enlargement under an active mercurial course are not likely to occur except the sore be syphilitic.

Excision of the Chancre.—The treatment of the chancre is a matter of considerable importance if the doctrine of a specific germ as the cause of syphilis is accepted. The local sore represents the seat of entrance of the germ. At this place it multiplies, and from it is distributed through the system. Prompt excision, destruction, or disinfection of this infecting focus seems as reasonable as would a similar procedure in the case of an ordinary poisoned wound. Experience has shown that excision, even if performed at the earliest period, does not necessarily prevent the development of constitutional syphilis, possibly never accomplishes this end, though there are many recorded cases which apparently prove that the disease in a small percentage of cases is prevented. Even though the procedure does not succeed in preventing the development of syphilis, it is reasonable to believe that by removing the original focus of infection the dose of the virus is lessened, and thus the effect upon the system is rendered less severe.

As for the practical application of the general principle of excision or destruction of a chancre, when the patient presents himself with a sore which has developed more than fifteen days after exposure, and which is chancrous in its mode of onset, if seen early, or in its development if seen after some days, the infiltrated and ulcerated tissue should be immediately removed or destroyed.

This treatment is even more imperatively indicated if by confrontation the diagnosis of syphilis can be more positively established. If the sore is on the prepuce, particularly about the preputial orifice, circumcision should be advised, since thus there is a removal of tissue wide of the infiltrated area. When the glans is affected excision followed by cauterization is indicated. If such excision and cauterization would imply mutilation of the glans so great as seriously to interfere with function, the operation should of course not be performed. When the lesion is on the inner layer of the prepuce close

to the coronary sulcus, it may be picked up with a pair of rat-tooth forceps and cut away with scissors.

Schleich's method of infiltration anæsthesia will render all these procedures absolutely painless, obviating the necessity for using ether.

If, because of objection on the part of the patient or for reasons sufficient to the surgeon, excision or destruction of the sore is not attempted, it should be cleansed and dressed in accordance with general surgical principles.

Constitutional Treatment of Syphilis.

At whatever period the treatment of syphilis is begun, the medicine first given is mercury in some one of its forms. This drug, properly administered, is a specific, and we can reasonably expect to definitely and permanently cure nine patients out of ten who conscientiously pursue for four years the course of treatment laid down for them. The patient must, however, not conceive the idea that his cure depends only upon the regular ingestion of the medicine which he is ordered to take. His general health must be brought to its highest degree of perfection, and thus maintained until the poison with which his system is infected is entirely eliminated or destroyed.

Before beginning the mercurial a general physical examination is made; the condition of the kidneys is determined by a number of analyses of the urine; the teeth are put in the best possible condition; the diet is regulated; the general life of the patient is so directed that it may be as hygienic as his surroundings admit; and he is instructed to pay particular attention to the cleanliness of his mouth, using a toothpick and brush after each meal, at night, and in the morning, and employing a mild antiseptic and astringent mouth-wash, such as diluted tincture of myrrh. It is well to have regular examinations of the blood made, since in this way timely warning as to the inadequacy of treatment may be given.

Instructions in regard to general hygiene and medication appropriate to the condition of the patient having been ordered, the questions as to the dosage of mercury and the form in which it shall be given are next to be considered. Patients with foul, decaying teeth are easily salivated. The toxic effects of mercury are still more readily manifested on those with chronic kidney disease. Under such circumstances the drug must be given with extreme caution and must be carefully watched. Occasionally a patient is encountered in whom even a small dose of mercury acts as a virulent poison. This is a matter of idiosyncrasy. With the exceptions just mentioned the drug can be administered safely in the doses hereafter named.

Mercury may be administered by inunction, by the mouth, or by

hypodermic injection. Baths, plasters, and vaporization are also employed as means of causing the absorption of the drug, but are so little used at the present day that I shall not consider them in this article.

Of the three popular methods just mentioned, the safest, most efficient, and least hurtful is that by inunction. The most convenient method—one which is in the majority of cases efficient—is by mouth administration. The method most prompt in its immediate effect, but most painful, most dangerous, and least applicable in private practice is by hypodermic injection.

All these methods have their proper indication, and one should not be used entirely to the exclusion of others. Whenever it is possible, however, I believe that the treatment throughout should be conducted by inunction. When for obvious reasons this method is inapplicable, the mercury should be taken by the mouth. In certain exceptional cases hypodermic injections will prove of the greatest service.

Inunctions.—I have been in the habit of using for inunctions the freshly prepared unguentum hydrargyri or blue ointment of the U. S. Pharmacopœia, undiluted. This is put up in half-drachm or drachm doses, either wrapped in wax-paper or enclosed in cachets. It is well to have the patient bring for inspection the first prescription which he has filled, since rancid ointment is often sold, or it is so stiff and hard as to be of little service. When he is thus familiarized with the proper preparation he is not likely subsequently to be deceived.

Taylor recommends the following preparation :

℞. Mercury,	ʒviij (240.0);
Lanolin,	ʒxxj (84.0);
Lard,	ʒxlv (180.0);
Compound tincture of benzoin,	♏clx (10.0);
Alcohol,	♏lxxx (5.65).

Triturate the mercury with the tincture and alcohol until coarsely subdivided. Then add portions of the lanolin and lard, and continue the trituration until the mercury is thoroughly subdivided. This ointment is put up in soft gelatin capsules called ovules, which contain either 30 or 60 grains.

Although the term inunction is used in describing this method of treatment, recent research seems to show that absorption is dependent rather upon prolonged contact of the ointment with the skin than upon vigorous friction. It is, moreover, apparent that this prolonged contact is less likely to produce dermatitis than is friction. Hence it is not necessary to instruct the patient to employ vigorous or prolonged rubbing, but rather to direct him to spread the ointment evenly over

a given surface, taking ten to fifteen minutes for this purpose; then to apply over this a woollen garment which should be changed not oftener than once a week.

When the patient is strong, well-nourished, has healthy kidneys and clean teeth, and has exhibited no idiosyncrasy to the drug, treatment may be started by ordering him a drachm of mercurial ointment a day. Anæmic, ill-nourished patients or those with visceral diseases are best treated by much smaller doses at the beginning.

The patient is directed to rub the first drachm of mercury into the left side of the body, using no pressure and simply carrying the hand over the surface of the ribs and the side of the abdomen until the ointment is evenly spread over this surface; this is best done before retiring at night. A flannel undershirt is then put on, over which can be drawn the ordinary night-clothes. The next morning the patient takes a sweat-bath, followed by a cool shower- or sponge-bath, and puts on clean underclothing, the undershirt worn the night before being laid aside for further use. The second night the second drachm is rubbed in on the other side of the body: the same undershirt is again put on. The third night the front of the chest and belly receive the ointment; the fourth night the small of the back, indeed all of the lower dorsal region that can be reached by the two hands; the fifth night, the whole surface of the left arm and shoulder; the sixth night, the corresponding portion of the right arm and shoulder; the seventh night, the left side again. The undershirt which has been worn for seven nights may then be destroyed or washed. In workingmen who are accustomed to wear the same underclothing for a week at a time the morning bath may be omitted, the undershirt being worn night and day.

During this course of treatment the patient should be seen at least every other day by the physician, and should be so instructed that he will recognize the prodromal symptoms of salivation. He should be weighed at least once a week and a record kept of his weight. It must be remembered that under the rubbing treatment salivation may be sudden and severe.

In the absence of symptoms or when under treatment they rapidly disappear inunctions should be given in series of twelve, an interval of six days being allowed to elapse between each series. When symptoms are present and do not yield, or if they develop during the course of inunctions, the quantity of mercury administered must be increased, and the inunctions must be continued without intermission until the symptoms disappear, unless salivation threatens. This may require twenty-four or thirty-six consecutive rubbings of 2 or even 3 drachms of mercury at each dose. When these large doses of the drug are administered the

patient must be kept closely under observation, and the physician must be on the watch not only for the ordinary symptoms of salivation, but for such signs of mercurial intoxication as loss of weight, deterioration in the condition of the blood, loss of appetite, diarrhœa, colicky stools, and albuminuria.

The length of time during which the inunction should be continued, with six days' rest after each series of twelve, is eighteen months. During this period there will have been six months' rest and twelve months of rubbing. The dosage must be most carefully regulated lest by over-zealous treatment the patient suffer more harm than he would from his unchecked disease; this may require the use of much smaller doses than those given. After eighteen months rubbing should be continued in series of twelves with an interval of twelve days' rest between each series, provided there has been no outbreak of symptoms. Under such circumstances a more active course of treatment should be instituted. After three years it is well to continue still a fourth year with a series of twelve rubbings, giving twenty-four days' rest between each series. In the third year moderate doses of iodide of potassium may be serviceable, even in the absence of symptoms. When tertiary symptoms manifest themselves iodides should, as a rule, be given, but not to the exclusion of mercury.

Exceptional cases will be encountered in which small doses of any of the iodides either disorder the stomach, produce acneiform eruptions upon the skin or rapidly diminish the body-weight. Under these circumstances it is best to omit the drug, unless a lesion is developing which by its effect upon a vital or an essentially important organ threatens to shorten the life of the patient or permanently cripple him.

After the fourth year all inunction treatment may be omitted unless subsequently specific symptoms develop. Under such circumstances treatment should be again instituted, and should be continued for at least six months.

Mouth Administration.—The administration of mercury by the mouth is the simplest method of giving the drug, and is the one commonly applicable, since the great majority of patients will not submit to the loss of time, the trouble, and the uncleanliness necessitated by inunction treatment. The physician has little difficulty in inducing his patients to take regularly, for months or years at a time, a medicine which can be carried in the waistcoat-pocket, and which can be ingested without attracting attention to the fact that a course of treatment is being taken.

The administration of mercury by the mouth is open to the objections that it is likely to produce a certain amount of gastro-enteritis,

and that the amount of absorption of the drug depends to a great extent upon the condition of the stomach and intestines, and hence must vary greatly even when the same dose is administered. In spite of these objections, the vast majority of syphilitic patients are treated by internal medication, and the results of this treatment are extremely good.

Of all the various preparations which may be given, I believe the preference should be given to mass. hydrarg., hydrarg. protiodide, and hydrarg. cum cret.

Since there is nearly always associated with syphilis, at least in its early stages, a more or less pronounced anæmia, iron is advantageously incorporated with the mercury. I have been in the habit of ordering the following prescription:

℞. Ferri carb., gr. ij (0.1);
Mass. hydrarg., gr. ij (0.1).—M.
Ft. pil. No. j.
Sig. Three to six such pills after meals, daily.

It is evident that patients vary greatly in their susceptibility to mercury, in their tolerance of this drug, and that varying quantities of the medicament will be required to subdue the symptoms of constitutional disease even in the same person. With the idea of determining individual susceptibility, and from this as a basis establishing an individual dose of mercury for each patient, Keyes formulated a plan by which he first produces by gradually increasing doses of the drug the prodromal symptoms of salivation. The mercury is then withdrawn till these symptoms entirely disappear, after which the patient is directed to continue throughout the entire course of treatment half the daily dose required to produce such symptoms. When secondary outbreaks occur the dose is increased until all manifestations of the disease disappear.

Absolute reliance cannot be placed on this method of gauging the dose, since individual susceptibility is subject to change, or it may be that absorption of mercury when taken by the mouth is so dependent upon the condition of the gastro-intestinal canal, and consequently varies so greatly at different times, that it is difficult to determine what portion of a dose taken into the stomach is absorbed into the system and is active in combating the disease. Keyes' plan of procedure is, however, an excellent one, and is to be commended as a routine practice.

In determining the quantity of mercury necessary to produce slight toxic effects the symptom of beginning salivation should be taken, rather than of intestinal colic and watery stools. The latter

often denote simply that gastro-enteritis has developed as the result of a local irritating effect of the drug. The urine should always be regularly examined at the beginning of the mercurial course, since the first symptoms of hydrargyrism are sometimes manifested in the forms of albuminuria and cylindruria.

Protiodide of mercury is one of the most popular preparations for mouth administration. Belief in its efficiency is perhaps based in part upon the hope that the chemical combination of mercury with iodine may produce the effect of each of these drugs when given separately. In many cases protiodide will be found more serviceable than any other form of mercury. At times it produces loss of appetite, griping pains, and watery stools long before sufficient mercury has been absorbed to favorably influence the course of the specific disease. Under these circumstances opium in small doses may be combined with it. This, I think, is undesirable, since the opium, though it may control the symptoms of stomach and bowel irritation, is not likely to lessen the catarrhal inflammation, the persistence of which materially interferes with proper absorption of mercury.

The yellow mercurous iodide (protiodide) may be given in pill or tablet form each to contain gr. $\frac{1}{6}$. The initial dose should be three pills daily, taken after meals. Every second day the dose is increased by one pill, till the earliest symptoms of salivation are produced. If, for instance, this occurs when twelve pills have been taken, after a period of rest devoted to curing the slight salivation, the pills are continued six a day, with intervals of rest, for four years, decreasing the dose and increasing the intervals of rest in the last two years.

Gray powder (hydrargyrum cum creta) may be found serviceable when protiodide disagrees, since it is not inclined to purge. It contains 38 per cent. of mercury, and should be given in 5-grain doses three to six times a day.

Bichloride may be administered in doses of $\frac{1}{12}$ of a grain well diluted. Because of the uncertainty of absorption when mercury is given by the stomach, and possibly because long continuance of the drug is likely to produce a condition of chronic gastro-enteritis, even though it be decided to treat syphilis by the internal medication, it is well to supplement this, or rather to substitute it at regular intervals, by the more certain method of giving the drug by inunction. This substitution is particularly important if the disease is not running a favorable course—*i. e.* if there are frequent and severe relapses or the patient's general condition is rapidly deteriorating. A course of fourteen inunctions may be given every six weeks; after two years, every twelve weeks; after three years, every twenty-two weeks. If it is impossible to employ inunction in this way, hypodermic injections

are serviceable. These also should be given in series and at intervals such as are appropriate for inunctions.

When, because of the amount of stomach irritation, one salt of mercury must be suspended, another may be substituted, remembering that one of the secrets of success in the use of the drug is to give it well diluted.

If after several attempts at substitution it is evident that mercury in any form by mouth administration is likely to keep up a chronic stomach indigestion and irritation of the bowels, the drug should be administered by inunction or by hypodermic injection.

Hypodermic Injection.—This method of administering mercury, so enthusiastically praised by certain leading syphilographers and heralded as the coming treatment of syphilis, seems now to have fairly found its place. It is not likely to supplant either inunction or mouth-treatment. It is, however, extremely serviceable in certain cases, and will probably be employed at times by nearly all syphilologists. Reference has already been made to the disadvantages of the method. It is often, not always, painful; it is impossible to predict when it will be painful or how long the pain will last: twenty injections may be given without occasioning any pain; the twenty-first given in precisely the same way may cripple the patient for days. It is more likely to produce severe toxic effects than when mercury is administered in any other form.

In careful hands abscess formation almost certainly can be avoided; therefore this need not be considered an objection to the employment of this method of treatment.

Two general classes of preparations are employed—the soluble and the insoluble. The soluble preparations are absorbed quickly, but their effect is transitory. The insoluble preparations lie in the tissues for months, acting as reservoirs from which is drawn a constant dosage of mercury. Their action is then slow, but prolonged.

Toxic effects much more frequently follow the use of the insoluble than of the soluble preparations. This can also be said of severe pain and suppurative inflammations.

As a rule, the soluble preparations are to be preferred for the reasons just given—*i. e.* promptness of action, painlessness, and comparative innocuousness. Probably the best preparation is that of bichloride. The syringe employed should be clean; it is well to wash it out thoroughly with boiling hot water several times, after this using a mild solution of formalin or absolute alcohol. The needle should be sterilized by boiling in a test-tube immediately before its use. The skin should be scrubbed well with absolute alcohol, and the needle should be driven in vertically by a sudden thrust until its point enters the muscular tissue, since the injection, if thus made, is less likely

to give pain and cause suppuration, and is more quickly absorbed. It is true that suppuration beneath the deep fascia is much more dangerous and difficult to treat than that superficially placed; if the injection is properly practised, however, there is little danger of this accident. The beginning dose should not be greater than $\frac{1}{10}$ grain, unless it has been previously established that the patient is not especially sensitive to mercury. This dose can be steadily increased until $\frac{1}{5}$ grain three to six times a week is reached. In some cases I have given double or even triple this dose with benefit to the patient.

The injection may be driven into the dorsal region or into the buttocks. If the dorsal region be selected, the needle should be entered half an inch to the right or left of the first six spinous processes. This enables the mercury to be forced into the muscular tissues at points where they are not richly supplied by sensory nerves. The first injection should be placed to the right of the first dorsal spinous process; the second to the left; the third to the right of the second spinous process, and the injection should be so continued downward. In keeping a record of the case the seat of each injection can be readily marked down on a rough diagram. This is particularly important when insoluble preparations of mercury are used, since thus in case of serious mercuric intoxication the surgeon is enabled to cut directly upon the seat of injection and turn out the medicament which has not yet been absorbed. If the injection is driven into the buttock, the space between the tuber ischii and the crest of the ilium is selected, the seat of each injection being carefully recorded.

As to the number of injections and the length of time during which they should be continued, these are not so well formulated as is the case with inunctions or internal medication. The assertion, at one time vigorously held by a number of practitioners, that syphilis can be permanently and promptly cured by a few injections administered during the early secondary period, is clearly disproved. If reliance is placed upon the hypodermic method, it is safe to assume that mercury must be continued as long as by any other method of administration, and that the quantity of the drug absorbed must be as great. This necessarily implies a continuance of injections for several years, with intervals of rest, depending upon the form of the drug administered and the susceptibility of the patient.

As to the frequency with which injection should be repeated, the soluble preparation should be given every third day, with a rest of one week in three after the first year. The insoluble preparations, such as calomel and gray oil, should be administered once in seven days, with a rest of one month in three.

Of the soluble preparations, the one I have found most serviceable is the following:

℞. Hydrarg. chlor. corros., gr. v (0.3);
Sodii chlor., gr. iij (0.15);
Aquæ destillat., ℥j (30.0).—M.
Sig. A 1 per cent. solution of corrosive mercuric chloride; 10 to 30 minims (0.65–2.0) hypodermically.

A stronger solution than this was so frequently painful that it had to be abandoned. Even this comparatively weak solution will at times occasion so much suffering that patients refuse more than one injection. Some, however, take it for months, complaining little or not at all. The initial dose should be not greater than $\frac{1}{10}$ of a grain —10 drops. This may be increased by 2 drops each injection until the dose of 20 or 30 minims is reached. Beyond this it is not advisable to go, unless symptoms are unusually persistent and resistant.

Of the insoluble salts calomel, gray oil and yellow oxide are the preparations of choice. Calomel is administered in suspension, either in glycerin or in oily menstrua. It and all the insoluble preparations give more pain than the bichloride injections, and are more likely to cause abscess. The drug employed should have been recently sublimed by steam, and should be emulsified in either freshly boiled glycerin, olive oil, or vaseline. The preparation should be conducted under all antiseptic precautions, and the emulsion should be protected against contamination by a sterile cotton plug or rubber stopper. One grain of calomel, repeated once in five or seven days, is the average dose.

The injection mixture may be prepared according to the following formulæ:

℞. Hydrarg. chlor. mit., gr. j (0.05);
Glycerinæ purificat., ♏x (0.65);
Aquæ dest., ♏x (0.65).—M.
Sig. Use as an injection.

℞. Calomel, gr. j (0.05);
Vaseline, ♏xx (1.30).—M.
Mix well and use as an injection.

In place of vaseline, boiled olive oil may be employed.

Gray oil is an emulsion of metallic mercury, and is made by thoroughly mixing lanolin with chloroform, allowing the chloroform to evaporate by triturating, and adding mercury 2 parts to 1 part of the semifluid lanolin. One part of the resulting salve added to 3 parts of olive oil makes the ordinary gray oil. The object of this preparation is to secure minute division of the metal and to maintain complete fluidity; it is usually warmed before being used. From 1 to 2

minims are injected every four to seven days for a month, after which a rest of four to six weeks is given.

Yellow oxide is thus prepared for injection:

℞. Hydrarg. oxid. flav.,	gr. xv (1.0);
Acaciæ,	gr. iv (0.2);
Aquæ dest.,	fl℥j (30.0).—M.

Of this preparation 15 minims are injected at a time. Other insoluble salts of mercury which have been employed and warmly commended are the neutral salicylate in 1- to 1½-grain doses weekly, thymol acetate in 1½-grain doses at from three- to six-day intervals.

Of the insoluble preparations I prefer the following:

R. Hydrarg. chlor. mit.,	ʒj (4.0);
Petrol. liquid. purificat.,	ʒj (4.0);
Lanolini,	ʒj (4.0).—M.

Sig. Three minims as an average dose.

The insoluble preparations usually require a hypodermic needle with a lumen larger than is necessary for the injection of absolutely fluid media. Nearly all combinations of mercury are likely to cause corrosion of the needle in a short time. This may be avoided by boiling the needle in slightly alkaline water immediately after it is used and washing it out with alcohol.

As to the value of the hypodermic method and the indications for its employment, there seems no reason for believing that it is likely to be adopted as a routine method of treatment in preference to other methods. The indications for its use are: In those cases in which, because of chronic gastro-enteritis or a particularly irritable stomach, all forms of mouth-ingestion are inadmissible and the employment of inunctions is impossible, either because of a sensitive skin or because of the environment of the patient; when from the seat of syphilitic lesion and its rapid advance the patient is threatened either by death or permanent crippling, and it is essential that the constitutional effects of treatment should be felt at the earliest possible moment; when the question of diagnosis must be settled promptly, as in the case of lesion of the tongue presenting some of the features of both gumma and cancer, or of sore upon the genitals not absolutely typical of chancre, and yet resisting local treatment—prompt disappearance of such a sore, together with the adenopathy under mercurial injections, would practically establish the diagnosis. The method is contraindicated when the kidneys are diseased and the patient is suffering from diabetes, marked visceral lesions of any kind, anæmia, or systemic dyscrasia.

The Use of the Iodides.—The value of the iodides in the treatment of syphilis is based on clinical experience. It is well known that these preparations powerfully stimulate the absorbent system; hence there is a partial explanation for their use in the lesions of late syphilis which are particularly characterized by excessive formation of imperfectly organized tissue made up for the most part of a small round-cell infiltrate. As a matter of fact, the iodides are of little service in primary or secondary syphilis, and it is not until the tertiary stage is reached—*i. e.* after eighteen to twenty-four months—that their use is indicated as a matter of routine practice. Exceptionally they may be efficient at a much earlier period.

Mauriac holds that iodides should be employed in the phagedenic forms of the initial lesion; in the beginning of the secondary period; especially to combat the headache and the erosive and ulcerative syphilides; in all the syphiloderms of transition, the papulo-squamous and papulo-tubercular; in all tubercular and all malignant syphilides; in all subdermic syphilitic manifestations; or in gummata or gummatous exudates that break down and ulcerate. He believes that the action of the iodides, though less rapid than that of mercury, is more certain and permanent.

Excepting in those early syphilides which approximate in type tertiary lesions—*i. e.* which are deep, ulcerative, and accompanied by extensive infiltration—the iodides are of such slight service in primary and secondary syphilis that their beneficial effects are more than counterbalanced by the irritation they produce upon the gastro-intestinal tract.

The dose of the iodides is to be measured by the effect produced upon the symptoms. This may lead to the administration of an ounce or even more of the drug daily; usually much smaller doses are efficient.

As to the administration of the drug, it is a point of cardinal importance that it should be given well diluted. At about the eighteenth or twenty-fourth month of syphilis it is the habit of the majority of syphilographers to continue the mercurial treatment, adding to it potassium iodide; this even in the absence of symptoms. Such a practice was perhaps originally based upon the theory that the usefulness of the drug was dependent upon the influence it exerted in rendering soluble and potent the residuum of a prolonged mercurial course and in encouraging its elimination. As far as elimination of mercury is concerned, modern research has failed to corroborate this belief. The reason for the administration of an iodide nevertheless exists, since it is a powerful absorbent, not only causing fatty degeneration and disappearance of huge gummata, but preventing the development of infiltrates.

For what is called the mixed treatment—*i. e.* the administration of mercury and potassium iodide—the formulæ vary in accordance with the method by which the mercury has been given. When the latter drug has been administered either by inunction or hypodermic medication, the iodide may be given in saturated solution, as will be presently described. If the mercury has been administered by the mouth, the following formula will be found serviceable:

℞. Hydrarg. biniodidi, gr. iv (0.2);
Potassii iodidi, ℥ss (15.0);
Syr. sarsap. comp., ℥vj (180.0).—M.
Sig. Teaspoonful in half a glass of water three or four times daily.

The quantity of the iodide and of the mercury may be varied to suit the requirements of the case. In the absence of symptoms 15 to 20 grains of iodide a day is as much as need be taken.

As a rule, it is better to give the iodides and mercury separately. For this purpose a saturated solution of iodide of potassium should be ordered, as follows:

℞. Potassii iodidi, ʒv (20.0);
Aquæ, q. s. ad f℥j (30.0).—M.
Sig. Five drops thrice daily in a glass of milk or water, increasing as required.

When advancing tertiary lesions so placed as to jeopardize life and usefulness are present, the dose should be rapidly increased. Thus the initial dose of 5 grains daily may be given to determine whether or not the patient exhibits an idiosyncrasy toward the drug. This dose should be doubled the following day, and thereafter should be increased 10 grains a day, remembering that the cardinal point in toleration, in at least so far as the stomach and intestines are concerned, lies in abundant dilution.

When the drug disagrees, and particularly when it has to be given in colossal doses, it is very well to combine it with essence of pepsin in the proportion of 10 grains to a teaspoonful, or, still better, to put the required number of drops of iodide in a glass of milk, adding essence of pepsin and a little sherry wine or other flavoring matter; the patient then takes the junket, which forms in a few minutes. Thus given, the stomach is extremely tolerant to the drug. At times other combinations of iodine are less irritating and more efficient than the potassium salt. A serviceable formula is the following:

℞. Potassii iodidi,
Sodii iodidi,
Ammonii iodidi, āā. ʒij (8.0);
Syrup. aurantii cort., f ʒj (30.0);
Aquæ, q. s. ad f ʒvj (180.0).—M.

The rubidium iodide has been warmly commended by Neumann. In the limited trial I have given it it has proven even more irritating than the potassium iodide. Iron iodide is serviceable when anæmia is marked.

It must be remembered that in the case of the iodides the production of slight toxic symptoms does not indicate that the full physiological effects of the drug have been obtained, and that when serious damage is threatened by a specific lesion the drug should not be stopped the moment coryza or other slight toxic effects become manifest. For diagnostic purposes it is often necessary to administer very large doses. Under these there seems good reason for believing that exceptionally infiltrations due to causes other than syphilis will disappear. If, however, distinct lesions are cured by mercury and iodides, this, practically, is sufficient ground for a diagnosis of syphilis.

The indications for the use of iodides are—

1. After two years of treatment with mercury, and in combination with this drug, in doses of 15 to 20 grains a day, provided there are no syphilitic symptoms. Iodides should be continued under these circumstances for six months.

2. In precocious secondary syphilis—*i. e.* when lesions are tertiary in type, affecting fibrous or connective tissues, bones, nerve-cells, or viscera, or when they cause deep ulceration or marked infiltration of the surface.

3. In all forms of tertiary syphilis.

Baths in the Treatment of Syphilis.—Baths are employed either for the purpose of causing absorption of mercury, the drug being held in solution in the bath, or for increasing metabolism and hastening elimination, thus allowing much larger doses of the medicament to be ingested than could otherwise be taken.

Mercurial baths are, under exceptional circumstances, extremely serviceable—thus when the skin-lesions are widespread and of a pustular or ulcerating type, or when, because of easily disordered stomachs and hypersensitive skins, patients do not readily tolerate either internal medication or inunctions.

A partial bath is often employed advantageously when lesions develop in particular regions, as about the buttocks or genitalia or upon the hands and feet.

The strength of the bath should be 1 in 20,000; the water should

be at a temperature of between 80° and 90° F.; the bath should be continued for between one and two hours, the temperature being maintained at a proper degree by the addition of hot water as it is required.

Hot-air, -water, or steam-baths given for the purpose of stimulating metabolism are steadily growing in favor. I have been in the habit of ordering hot baths in the routine treatment of syphilis whenever the patient exhibits no idiosyncrasy against them, and when his circumstances are such that they can be taken. It is highly probable that all the advantages of the thermal springs, excepting those incident to change of air and surroundings, can be obtained by the judicious use of hot baths at home. It is absolutely certain that by their use much larger doses of mercury can be tolerated, and that, as a rule, the general health is markedly improved. The Turkish bath taken daily or three times a week is the most serviceable form of applying heat and moisture. Next in order of efficiency comes the hot-air bath, and, finally, prolonged hot soaking in water (from 108° F.).

Arrangements may be made for the daily hot steam-bath in almost any bathroom or bedroom. At a very moderate expense a box can be constructed of such height and size that a patient sitting on a chair has his body entirely enclosed, with his head thrust through a hole in the top. In this box beneath or behind the chair is placed a gas stove or coal-oil or alcohol lamp. The patient is seated in the box, the lamp is lighted, the door and lid are closed, towels are packed about the opening through which the heat projects. In five to fifteen minutes a dripping perspiration is produced. The patient then takes a cool shower-, sponge- or plunge-bath and dries himself vigorously with a towel. This bath should be taken every morning unless from idiosyncrasy it is found to be weakening. It is usually refreshing, and under it patients gain in weight. Even when these hot vapor-baths are taken, I believe one or two Turkish baths in a week are serviceable.

Borovski, who has made a careful study of the effect of hot baths in the treatment of syphilis, shows that both tepid and hot-water baths as well as those of sulphur and hot air, invariably increase the elimination of mercury in the urine, and that this elimination proceeds more energetically the higher the temperature to which the patient is exposed. He holds that the organism of the patient who has been mercurialized can be entirely freed of the drug by means of the systematic employment of heat, and that mercurial stomatitis can be cured by this agency more quickly than by any other means. Hot-air baths are especially serviceable, since the drug is eliminated through the sweat-glands, which are so powerfully excited. These are especially

to be preferred when it is desirable to clear the patient's system of the drug. The precaution should always be taken when hot baths are given to have an attendant present, since syncope is sometimes produced. In themselves hot baths are powerless to cure syphilis.

Aside from the more careful use of the specific drugs, the avoidance of mercurial intoxication, closer attention to the general condition of the patient, and the treatment of dyscrasia with which the disease may be associated, the therapeutics of syphilis has not been materially changed in recent years. But two suggestions worthy of note have been advanced: one is a different method of administering mercury; the other is the application of a new therapeutic principle to syphilis.

Intravenous Injection.—Bacelli has proposed to give mercury by *intravenous injection of corrosive chloride*, holding that thus the dosage is more accurate and the effect more rapid and powerful than when a much larger amount of the drug is given in other ways. This is the solution he employs:

℞. Hydrarg. chlor. corros.,	gr. j (0.05);
Sodii chlor.,	gr. iij (0.15);
Aquæ dest.,	ʒij (60.0).—M.

Sig. From 20 minims to a drachm daily by intravenous injection.

The median basilic or cephalic vein is made prominent by winding a fillet about the arm and getting the patient to contract the muscles strongly with the elbow extended. The skin overlying the vein is thoroughly cleansed, and the needle of the syringe, after having been boiled and attached to the filled syringe, is driven directly into the vein. The injection is then made slowly. If it is not painful, and particularly if there is no subcutaneous tumefaction, it has evidently passed into the lumen of the vein and been carried away by the blood.

Intravenous treatment of syphilis has not been tried in a sufficient number of cases to determine its value or its harmlessness. It should be considered as a means of bringing the system rapidly under the influence of mercury when progressive lesions threaten vital organs.

The serum treatment of syphilitic lesions dispenses altogether with mercury and iodide of potassium, and attempts to combat syphilis by injecting into the system an antitoxin which inhibits or destroys the germs of the disease. The commonly accepted theory in regard to immunity from any disease rests on the fact that as a result of the introduction of micro-organisms into the system there are produced substances not only injurious to the host, but also those which neither destroy the micro-organisms themselves nor render the soil in which they grow immune against infection. The clinical history of syphilis

leads us to believe that this immunizing substance is found in the blood of man, and that upon its existence depends, for instance, the resistance which the apparently sound mother of a syphilitic child offers against contracting the disease either from her offspring or from any other source, or the resistance which the apparently sound child of syphilitic parents offers against contracting the disease. It is believed that the protecting serum is filtered through the placenta, and that immunity from maternal syphilis would be observed very much more frequently than is now the case, were it not that through traumatism or inflammation the indirect communication between the maternal and fœtal blood is made direct, and hence not only the immunizing substance, but the active living micro-organisms, are carried from the diseased to the healthy human being, and thus in place of acquiring simple immunity the child has implanted upon it syphilis itself.

It is apparent, since the kidneys are functionless in intra-uterine life, and since the micro-organisms of syphilis exhibit especial virulence when they attack the fœtus, that there should be in the circulation of the child syphilitic at birth both immunizing substances and toxic products in unusual concentration. These may be separated from each other by heat.

On the basis of these considerations Bonaduce conducted a clinical study with blood-serum from children hereditarily syphilitic. The results in a few cases were apparently extremely favorable. Various modifications of the serum treatment have been reported with apparently satisfactory results. It is still, however, absolutely in its experimental stage.

Local Treatment of Syphilis.

The chancre should be kept clean and protected from irritation. It must be remembered that it offers an open granulating surface, hence that infection with the ordinary pyogenic germs may readily take place and involve the lymphatics. Indeed, suppurating bubo from chancre is more common than is generally supposed.

I have already advised that chancres should be removed as soon as they are seen, and that the resulting wound should be closed by suture. This is the best treatment, and, even though it does not abort syphilis, it is followed by prompt healing. Under internal medication healing is, however, very rapid.

When the surgeon believes in allowing the chancre to reach its full development, the germs to become widely diffused through the system, unchecked by specific treatment, and eruptions to develop upon the skin and mucous membrane before the administration of mercury, the chancre may become large and troublesome. Under

these circumstances it should be cleansed night and morning, preferably by spraying it with dilute antiseptic solution, carbolic 1 : 500, bichloride to 1 : 5000, dried, and dusted with calomel and zinc oxide, equal parts of each. If this exhibits a tendency to crust, with retention of discharge beneath and congestion and œdema about the sore, wet dressings or ointments are indicated. Wet dressings are best applied by soaking pledgets of cotton in black-wash, placing them over the sore, and securing them in place by a gauze bandage kept constantly wet with a solution of lead-water and alcohol, equal parts.

A serviceable ointment when the discharge, though moderate, is too free to allow the use of a dusting powder, is—

℞. Ichthyol, ʒss (2.0);
Emplast. hydrarg., ʒiiiss (14.0);
Cerat. resinæ, ʒiv (16.0).—M.
Sig. Locally.

Sluggish granulation should be touched with the solid stick of silver. A tightly adherent pseudo-membrane should be destroyed by nitric acid or acid nitrate of mercury, or should be scraped off with a sharp curette, the part being subsequently cleansed and dressed as already described.

Chancres in which the discharge is extremely slight or those in which there is no ulceration are best protected by a film of cotton kept in place by collodion.

Syphilitic buboes—*i. e.* the enlargement of the lymphatic glands anatomically related to the seat of chancre—are best treated by inunctions of mercurial ointment, a quarter of a drachm being rubbed in daily over each bunch of glands.

The syphilides are benefited by the application of mercury to the surface and the systematic employment of hot baths.

The erythemata respond so promptly to medication that they rarely require local treatment.

Papular syphilides are often obstinate, particularly when they appear in the papulo-squamous form. They yield best to inunction and massage and vapor-baths. Local vaporization is especially serviceable. Thus, when the hand is affected it may be placed in an inverted box which is filled with calomel vapor by means of an alcohol lamp and a small metal dish.

Mucous patches are best avoided by cleanliness; when they appear they may be brushed several times daily with the solid stick of silver nitrate or a 10 per cent. solution of this drug. An antiseptic astringent mouth-wash should be used frequently, together with a mild antiseptic spray. As a mouth-wash diluted tincture of myrrh answers

excellently, a teaspoonful of the myrrh being added to a glass of water. It must be remembered that the appearance of mucous patches usually indicates that mercury is not being absorbed in sufficient dose to control the disease; hence in addition to the local treatment it is wise to push the specific treatment for the time being.

Ulcerative patches in the fauces should be subject to the same treatment as mucous patches.

Scaly patches on the mucous membrane are exceedingly obstinate to treatment, and may persist for weeks or months, nor do they seem to be beneficially affected by pushing general treatment. They sometimes disappear under the stimulant and resolvent effect of iodine, which may be used locally as in the following prescription:

℞. Iodi, ʒij (8.0);
Potassii iodidi, ʒiij (12.0);
Glycerinæ, ʒiij (12.0).—M.
Sig. Apply locally to scaly patches.

A cauterant effect is usually required, such as that resulting from the application of a 10 per cent. chromic-acid solution or acid mercuric nitrate, one-half strength. The sharp curette is sometimes needed for their removal.

Condylomata may be destroyed by applying to them

℞. Plumbi oxidi, gr. iv (0.2);
Liquor potassii caust., 33 per cent., ʒij (8.0).—M.

Iodoform is then dusted over the surface. In two or three days the crust thus formed comes away. The application may have to be repeated two or three times. Chromic or nitric acid is a more certain cauterant. In mild cases no local treatment is required beyond cleaning and dusting with calomel. Very extensive cases should be shaved off with a knife.

The pustulo- or pustulo-crustaceous syphilides are favorably affected by mercury or vapor baths, supplemented by calomel and zinc ointment.

Tubercular and non-ulcerating gummatous syphilides are best treated locally by the continuous application of mercurial ointment. Absorption seems to be encouraged by the hot-water bag, which may be placed directly upon the dressing which contains the ointment.

Exceptionally, there develops a chronic serpiginous, slowly-spreading, persistent syphilide, which seems to resist all forms of local and general treatment. This lesion may yield to a prolonged bath lasting days or weeks. If this fails, the actual cautery should be tried.

Ulcerating surfaces are treated by the curette and the cautery in

accordance with general surgical principles, and diseased bone is subject to the same surgical treatment as when due to causes other than syphilis.

Hereditary Syphilis.—As in the acquired disease, hereditary syphilis is treated and cured by mercury and potassium iodide. By appropriate treatment directed to the parents, transmission of the disease may often be prevented, though the only sure prophylaxis, and one which the practitioner should invariably advise, is the avoidance of marriage, or certainly the avoidance of paternity, for a period of at least four years after the appearance of a chancre. When patients who are syphilitic marry they should be subject to the most careful and persistent treatment.

If pregnancy should occur from a syphilitic father, the mother should receive constitutional treatment during the entire period of utero-gestation. This is even more imperatively indicated if she has been previously syphilitic or has been infected at the time of conception or shortly before or after this.

Immediately after birth the syphilitic child should be given a mercurial, and specific treatment should be continued with appropriate intervals of rest for at least four years. It would seem wise to lengthen the period even beyond this, giving such children an intermittent course of treatment until past the age of puberty.

The children of syphilitic parents may exhibit lesions of syphilis at birth, may be healthy at birth but in from three to five weeks may develop characteristic symptoms, or may be healthy at birth and remain without any manifestations of syphilis throughout life. To a child exhibiting lesions at birth specific treatment should be given at once. If the child is apparently healthy at birth, it should also be treated at once if the syphilis is maternal and recent and has not received vigorous mercuric treatment. If, however, the syphilis is old, is paternal, and has been vigorously treated, and if, moreover, during the period of utero-gestation the mother has received properly directed specific medication, it is safe to wait for the manifestations of syphilis before treating the child.

In cases not corresponding to either of the types just mentioned it is probably wise to wait for secondary symptoms, in the mean time making a careful examination of the child's blood, and instituting treatment the moment this shows diminution in hæmoglobin and increase of white corpuscles without appreciable cause other than syphilis.

The method of treating a child is as follows: The surface of the belly is washed with castile soap and warm water, then with a saturated solution of boric acid, and is finally dried. Upon the child's binder is spread half a drachm of an ointment made up as follows:

℞. Acid. carbolic., ♏j (0.05);
Ung. hydrarg., ʒij (8.0);
Cosmoline, ℥j (30.0).—M.

The binder is then applied as is usual in infants, and is worn for twenty-four hours, after which the belly is again washed with soap and water, followed with boric acid; ½ drachm of the ointment is rubbed in and the binder again applied. This binder is changed for a fresh one every fourth day.

Should dermatitis result from the prolonged application of the ointment, the inflamed skin should be washed with witch-hazel, dusted with carbolized talc, and the mercury should be administered in the form of inunctions, various surfaces being selected for the rubbings, the dorsal region being the one of choice.

It happens at times that because of the hypersensitive skin inunctions cannot be given. Under such circumstances it is wise to resort to hypodermic medication, a solution of 1 per cent. sublimate being used. The initial dose should be 1 minim, $\frac{1}{100}$ grain, every second day, the quantity being gradually increased to 2, 3, or 4 minims.

If the sublimate injections cannot be administered, medication by the mouth is indicated. Probably the most efficient formula is the following:

℞. Hydrarg. cum cret., gr. iii–iv (0.15–0.2);
Sacchar. albi, gr. iv (0.2).—M.
Div. in chart. No. xij.

One powder three times a day, to be taken soon after nursing.

The mercurial should be continued alone with intermissions for two years, after which, for a period of six months, potassium iodide should be added. The formula suggested by Bumstead and Taylor is—

℞. Hydrarg. biniodidi, gr. j (0.05);
Potassii iodidi, ʒiv (16.0);
Syr. sarsaparillæ comp.,
Aquæ, *āā.* f℥ij (60.0).—M.

Of this mixture a patient over five years old may take half a teaspoonful, the dose being gradually increased to 1½ teaspoonfuls three times a day. For younger children the dose is proportionately diminished. At the time this is being given the mercurial ointment is used externally.

It is probably better to give the iodides separately, a saturated solution being employed, and the drops being administered in milk, which so disguises the taste of the drug that it is taken without dif-

ficulty. The initial dose for a child two years old should be 1 grain three times daily. This may be increased a grain at a time.

It is often wise to employ the iodides considerably before the end of the second year, since hereditary syphilis exhibits a tendency to become tertiary in type even in the early secondary period. Under such circumstances the iodides should be added to mercurial treatment.

In very exceptional cases where inunctions, hypodermic medication, or mouth-administration are impracticable, mercury may be given to the mother with the idea of influencing the child through her milk. This is at best, however, an uncertain and unsatisfactory method of treatment.

The periods of rest in the systematic treatment of a syphilitic child correspond in general with those already described as appropriate in the treatment of syphilis in the adult. The reason for continuing the treatment somewhat longer is founded upon the much greater virulence of hereditary syphilis, and the strong tendency which the disease exhibits to recur at the periods of dentition and before and during puberty.

Parasyphilitic Phenomena.—Though it has been many times repeated that mercury and iodide of potassium will cure syphilis, this must by no means be taken to mean that every person who has suffered from syphilis should be given these drugs for the cure of all maladies from which he may subsequently suffer.

Following syphilis, often by a long interval, are many phenomena which Fournier has aptly termed parasyphilitic. These may be in part due to the destructive effect of the original disease, but are not syphilitic in any other sense, and are not modified in the slightest degree by syphilitic treatment. Thus, herpes is extremely common in those who have had syphilis. Mercury distinctly aggravates it; it is not influenced favorably by any form of treatment.

Headaches are not uncommon in the late tertiary period of syphilis. Often, probably in the majority of cases, they are of inestimable value, being prodromal of grave brain lesions, and leading the practitioner to institute early an active course of treatment which, if sufficiently vigorous and prolonged, will prevent the development of incurable brain lesions. There is, however, another form of headache the prognosis of which, in so far as paralysis or other grave brain lesions are concerned, is not alarming, but which persists for months or years and is aggravated by specific treatment. It corresponds to the neurasthenic type of cephalalgia, and is benefited by the treatment adapted to neurasthenia.

In determining between these two forms of headaches it should be remembered that syphilitic cephalalgia prodromal of brain lesions never lasts more than a few weeks or months before the unmistakable

symptoms of profound brain involvement develop, and that the beneficial effects of vigorous treatment are noted promptly.

In hospital practice, and exceptionally among private patients, the surgeon occasionally sees syphilis manifested in the form of profound cachexia, marked involvement of the liver, spleen, and kidneys, and extensive destruction of the bones and overlying soft parts. Specific treatment avails little in these cases.

Perhaps the safest rule to follow in the late lesions, whether they be of the surface, the viscera, or the nervous, vascular, or respiratory system, is to make one faithful effort with mercury and the iodides. If no improvement is noted, or if, as is often the case, symptoms are aggravated, reliance should be placed upon general tonic and supporting treatment. The trial with the specifics should, however, be thorough and should be conducted under the most favorable circumstances.

In conducting the treatment of syphilis there are rules of procedure to be observed and cardinal facts to be remembered so important that I cannot do better than close my paper by formulating them as follows:

Summary of the Treatment of Syphilis.

1. The constitutional treatment of syphilis should be inaugurated as soon as a probable diagnosis of chancre has been formulated.

2. The first step in the treatment should be the excision of the chancre.

3. Mercury should be the basis of treatment in all periods of syphilis.

4. This is most efficient when administered by inunction.

5. The proper dose of mercury is the largest which can be taken without injury to the health. The development of lesions indicates that an insufficient dose of mercury is being absorbed. When during the course of specific treatment there is steady deterioration in the health, the physician must assure himself that this is not due to mercurialization.

6. A daily hot-air bath enables the patients to take larger doses of mercury than is possible without this form of bathing.

7. Treatment should be continued for at least four years, with appropriate intervals of rest. After the second year a six months' course of iodide of potassium should be added to the mercury.

8. Tertiary symptoms are best treated by a combination of mercury with the iodides.

9. When late tertiaries develop after a four-year course treatment should not be limited to the cure of such tertiaries, but should be continued for at least six months afterward, and should be vigorous. This is particularly important in cerebral syphilis.

10. Parasyphilitic phenomena should not be treated by mercury and the iodides.

11. Patients with syphilis should not be allowed to marry until four years have elapsed from the development of the chancre. Syphilis is transmitted much later than this, but as only a rare exception.

12. A child of syphilitic parents is best protected from inheritance of the disease by vigorous mercurial treatment of the mother during the period of gestation. This treatment must be strictly confined within the toxic limits.

13. Treatment of syphilitic children should continue with intermissions beyond the period of puberty.

TYPHOID FEVER AND MALARIAL DISEASES.

By J. M. ANDERS, M. D., LL. D.

TYPHOID FEVER.

Prophylaxis.—Typhoid fever is dependent upon a peculiar bacillus discovered by Eberth. It is not deemed necessary to adduce any facts or arguments here with a view to establishing the specificity of this disease, but it may be safely assumed that the *bacillus typhosus* has pathogenic power. To prevent the spread of the specific infection is the first duty of the physician who undertakes to treat typhoid fever.

The Typhoid Bacilli Outside of the Body.—Certain points pertaining to the life-history and the more common modes of conveyance of the specific organism should be adduced at the outset. Uffelmann states that pure cultures of the typhoid bacillus, mixed with the fæces, dried and kept under observation a long time, stand the drying test much better than the cholera bacillus. In dried earth, in white sand, and on pieces of clothing the bacillus lives as long as two months. He found that dust from these dry substances will infect gelatin and milk, from which pure cultures may be obtained. This also shows that the atmosphere may be the bearer of the typhoid contagium. Uffelmann further observes that the typhoid bacilli propagate upon the earth's surface, and that they may penetrate to a considerable depth where the soil is repeatedly moistened. On the other hand, it has been shown that certain influences are decidedly hostile to their prolonged external existence. Karlanski found that the bacilli in the excreta exhibited less tenacity of life, owing to the presence of other bacteria, than the bacilli in the pure cultures. Again, air and sunlight shorten their lives.

In water the bacilli preserve their vitality for weeks, and it is generally believed that they grow and multiply in this medium. In competition with saprophytes, however, they disappear from ordinary water in a few days (Osler). The fact is to be emphasized that the most common source of the typhoid poison is the drinking-water supply, and that most epidemics traceable to it have been found to be occasioned by contamination of streams, often leading to reservoirs, wells, or springs. Since the existence of the bacilli in water is limited to a few weeks, more or less constant pollution is necessitated for pro-

tracted epidemics. Freezing does not kill the bacilli, but, on the contrary, they may live in ice for months (Prudden). They have been found by Prudden and Ernst in the water-filters of homes in which typhoid had appeared.

In milk, particularly when fresh, the typhoid bacilli exhibit a rapid growth. While, as before intimated, milk exposed to the air may become directly infected by dust, more often it is polluted by infected water used to dilute the milk or to cleanse the cans. Milk has been justly held responsible for a number of greater or smaller epidemics of typhoid. It is obvious that any article of diet may be contaminated by exposure to an atmosphere containing the contagium, or by the washing of raw vegetables or other food-stuffs with infected water, or by the uncleaned fingers of the patient or nurse. The oyster may become infected during the process of freshening by sewage-polluted water, in which it flourishes. The *bacillus typhosus* will live in the oyster for a considerable period of time.

The Typhoid Bacilli Within the Human Body.—The sufferer from typhoid becomes a distributing focus from which the specific poison may become widely scattered, unless proper precautions be taken. It is a generally accepted fact that the bacillus gains the interior of the body almost invariably through the intestinal canal. As I have said (*supra*), it is ingested chiefly with the drinking-water, less frequently with milk, and rarely with oysters, raw vegetables, fruits, etc. It may also be conveyed to the mouth by the soiled fingers of laundresses, patients, and attendants, and in very rare instances may even be inhaled or communicated by contagion.

The typhoid bacilli leave the body chiefly along with the stools. The urine (when albuminous), the vomitus, and the sputum may also contain them.

Destruction of the Bacilli by Disinfection.—Since the typhoid bacilli have no permanent, independent existence in the outer world, their complete and immediate destruction upon leaving the body constitutes the chief and most certain method of limiting the spread of this now common complaint. This is accomplished by thorough disinfection of the *stools*, *urine*, *vomitus*, and *matters expectorated*, if any. Although the bacilli are found in the urine only when albuminous, and in the vomitus and sputum only exceptionally, these excreta should in all instances be treated promptly and in the same manner as the stools. If the details connected with this process were to be carried out with a rigor proportioned to the real importance of the matter, typhoid could practically be stamped out in the course of a single decade. It is not an exaggeration to claim that our hygienic resources enable us to destroy effectually the pathogenic organism at the moment it escapes from the body.

Disinfectant Solutions.—Of these, chlorinated lime, if of good quality, heads the list. It should contain at least 25 per cent. of available chlorine; and the strength of the solution used should be six ounces to the gallon of water. This has been used by myself with entire satisfaction, both in hospitals and private practice, for many years. Another liquid disinfectant is the solution of mercuric chloride, 1 : 500, acidulated with hydrochloric or tartaric acid. The objection to mercuric chloride for the disinfection of sputa or fæces is that it forms an insoluble compound with albumins (Billings). A solution composed of equal parts of sulphuric or hydrochloric acid and water is efficient. A 5 per cent. solution of carbolic acid is much employed.

Methods of Applying the Disinfectant Solutions.—To secure the reception of the dejections in the bed-pan or other suitable receptacle is the first important step, and the immediate disinfection of them is the second. The chlorinated lime solution is selected. It is my custom to order one pint to be put into the bed-pan before, and from one to two pints (according to the quantity of the dejection) immediately after, the stool has been passed; the whole is thoroughly mixed by stirring and shaking the vessel, while the solid masses are broken up with a stick (which must be burned at once), so that every particle of the matter is directly acted on by the solution. The vessel is then allowed to stand for three hours before it is emptied into the water-closet.

The solution of mercuric chloride may be employed in a similar manner, but the stool after being treated with it must be allowed to stand for six hours, since this is the shortest period in which it can be thoroughly disinfected. The solution of carbolic acid (5 per cent. strength), used rather lavishly in divided portions, followed by shaking in order to thoroughly mix with the contents of the bed-pan, may be used. There is a valid objection to this agent—namely, that it requires twenty-four hours to disinfect a typhoid stool. The mixture of sulphuric or hydrochloric acid and water will effectually kill the bacilli in two hours. The urine is to be treated in the same way and no less rigorously than the stools, and care should be exercised that neither bed- nor body-linen is wetted by it. I employ the chlorinated lime solution for this purpose. The vomitus and sputum (particularly in pneumo-typhoid fever) are to be received into suitable vessels, and the same rigid methods of disinfection applied as in the case of the fæces and urine.

It is advisable to flush the water-closet frequently in order to diminish the corrosive action of the disinfectants upon the house-drain and fittings. If the stools be completely disinfected, it matters not where they are emptied, but in cases in which this precaution has

not been observed, water-closets and privy-vaults may require disinfection. For the latter purpose the liquor zinci chloridi (Pharmacopœia, 1880), containing 170 grains (11.016) of the chloride to the fluidounce, may be employed. Of this, 1 pint may be mixed with 4 gallons of water, and then poured freely into the water-closets, privy-vaults, or cesspools into which the typhoid discharges have been thrown. The saturated solution of the chloride of zinc can readily and extemporaneously be prepared by dissolving common zinc in commercial hydrochloric acid. This may be diluted in the proportion of 1 pint to 3 or 4 gallons of water, when it is ready for use. It is a good plan to sprinkle the surface of the contents of the privy-vault or cesspool with quicklime daily.

Additional Directions to be Given to the Nurse and Attendants.—After a stool the nates are to be wiped with paper, and then more thoroughly cleansed with a small compress-cloth wet with a solution of mercuric chloride (1 : 2000) or of carbolic acid (1 : 40). The bed-pan and hopper are to be washed with a solution of mercuric chloride (1 : 1000), and then wiped dry, while the cloth used must be immediately burned. It should be an invariable rule to change the bed- and body-linen daily, and to change them immediately when soiled. The mattress, which cannot be changed readily, should be protected by a rubber cover. The latter, as well as any of the bed-clothing, are to be changed at once when soiled. The rubber covers, the changed linen, the soiled bed-clothing, and towels should be received on, and wrapped in, a sheet steeped in a 5 per cent. solution of carbolic acid, and removed quickly to the laundry, where the patient's linen and bed-clothing are to be boiled for a half-hour. The rubber sheets (if used) and covers are to be washed with a carbolic-acid solution (1 : 20), after which they should be washed with soft soap, then well aired for from six to eight hours, and, if possible, exposed to the direct rays of the sun. The blankets and bed-spreads are also to be aired from six to eight hours daily. Fitz recommends that the feeding-utensils immediately after using be thoroughly cleansed in boiling water. The corpse, when death occurs, must be wrapped in a sheet wet with a solution of carbolic acid (1 : 20). When the patient has left the hospital or sick-room the mattresses are fumigated, unless they have been carefully protected by the rubber coverings, and in all cases they are to be aired daily for a week. The rubber covers and the bedsteads are to be washed with a solution of mercuric chloride (1 : 1000). Thorough and, if practicable, cross-ventilation of the sick-room in private houses is to be secured for a week before it can be safely reoccupied.

The measures thus far considered and advised are intended to prevent the patient from disseminating the bacilli, and, as I have before stated, they are of paramount importance and of certain

efficacy if conscientiously followed out. The correctness of this view is shown by the indisputable fact that local epidemics have been repeatedly traced to common sources of water-supply or milk-supply which have been contaminated by the excreta of a single typhoid subject. Among notable instances was the epidemic of 1885 at Plymouth, Pa., during which 1200 persons fell ill and 130 died. All of the cases started from a single patient, whose dejecta had not been properly disinfected, but were carelessly disposed of, polluting the water-supply of a portion of the town. Other epidemics, due to defiled water-supply, have been reported by Seneca Egbert, Rodet, Arloing, and Morat, as well as others. Evidence of a practical kind, to show that local epidemics may be due to infected milk, has been furnished by the reports of outbreaks which were traced to this origin by a number of observers (Ballard, Cameron, Almquist, Smith, and Littlejohn). It will be remembered that such outbreaks are due to the use of polluted water for the purpose of diluting the milk, washing the cans, etc.

Municipal and Governmental Means of Prophylaxis.—Once the primary origin of epidemics or endemics of typhoid has been definitely ascertained, the means of arresting their march are readily suggested by competent municipal or State boards of health. Unfortunately, however, the latter bodies are not always empowered by sufficient authority, owing to lack of appreciation on the part of the general public of the importance of correcting sanitary defects and abuses, or of the value of reliable measures calculated to minimize the prevalence of, and death-rate from, enteric fever. The best-directed efforts to ascertain the source of the infection in many sporadic cases, as well as in limited epidemic appearances, are often futile. We are in the habit of attributing these visitations to a greater or less contamination of the water-supply or to defective drainage, although too often, perhaps, erroneously. It must not be forgotten that sporadic cases or slight outbreaks may be due to certain articles of food, particularly the oyster (*vide supra*). Again, in cases of indeterminate source it is often possible to obviate fresh cases by intercepting and destroying the bacilli *en route*, knowing as we do the usual modes of conveyance of the poison. Thus, during the progress of a case of typhoid in a private family the drinking-water and milk used by the patient and other members of the household should be boiled for a half-hour before being ingested. If an epidemic be prevailing, all of the families in the community should adopt the same precautionary measures. New-comers, particularly if they have removed from rural districts to large cities in which typhoid prevails, should use only boiled drinking-water and milk, eschewing at the same time uncooked vegetables, fruits, and oysters.

It is a well-established fact that the returns of the typhoid cases in a city may be regarded as a safe indication of its sanitary status. On the contrary, whatever tends to better the sanitary arrangements of a city tends in a decisive manner to diminish the prevalence of the disease, and this is particularly true of any improvements effected in the water-supply and the sewer-systems. Thus in some large cities purification of the contaminated water-supply has been followed by a remarkable reduction in the death-rate from typhoid; *e. g.* in Vienna from 12.5 per 10,000 to 1.1 per 10,000. The best method of rendering a polluted water-supply pure is by the most recently approved methods of filtration upon a large scale. Whenever practicable, however, an impure water-supply should be replaced by one obtained from the lakes and running streams to be found in the primitive forests of uncivilized mountainous regions.

Medical and sanitary literature also furnishes convincing practical proof of the happy effect of *improved drainage* in lessening the prevalence of typhoid fever. Without stopping to cite special instances, it may safely be stated that perfection of the sewer-system of a city is little less effective in this direction than a reliable water-supply. It is especially noteworthy that the water obtained from streams contaminated with sewage frequently produces typhoid outbreaks, and that the supply derived from a point near to the discharging sewer-mouths is particularly pernicious.

Isolation of Typhoid Patients.—I am of the firm belief that in hospitals it is advisable to isolate typhoid cases so far as possible and to keep them in special wards; in private families in separate apartments, into which none but the attending physician and nurse should enter. There is incontestable proof that typhoid fever is feebly contagious. Moreover, it obeys the laws of contagious diseases. The preventive treatment must be conducted on the same principle as governs the treatment of other infectious diseases. It must aim to cut off not only the chief, but every, channel of communication from the sick to the healthy, since the demands of hygiene cannot, under less exacting conditions, be fully satisfied.[1]

Preventive Inoculation of Typhoid Fever.—Quite encouraging results have been obtained from preventive inoculations with the typhoid virus. Iwanow[2] has successfully immunized monkeys. Pfeiffer[3] reports favorable experience with inoculations of healthy persons, describing his methods. He believes that this mode of prophylactic treatment promises to render great services in epidemics of typhoid fever and in military camps threatened with the disease.

[1] For illustrative cases see *Phila. Hospital Reports*, 1891, vol. i. p. 149.

[2] *Bolnit-Schnaja gaseta Botkina*, No. 20.

[3] *Deutsche med. Woch.*, No. 46.

Treatment.

General Management.—The general conduct of the case is of paramount importance to the sufferer from typhoid fever. To him the skilful trained nurse is a prime necessity. When a good nurse cannot be had, the attending physician must give in writing the directions regarding the disinfection of the excreta, the bed-linen, and utensils, as well as regarding the exhibition of the food, medicines, etc. The patient, so soon as the indications point pretty clearly to this condition, should be put to bed, and kept there continuously in the recumbent posture until the end of the attack. I am convinced that no other measure is comparable, in its favorable influence upon the course of cases of typhoid, particularly in the earlier stages, with absolute bodily rest. On the contrary, it is a matter of common observation that those who feel themselves unable or unwilling to give up until the disease is fully developed present the more serious forms of the affection. A similarly unfavorable influence in the development and course of the disease is noted among patients who are obliged to travel long distances during the invasion period, as well as among those whom it is necessary to remove from their homes to hospitals during the different stages of the disease. The use of the bed-pan and urinal is to be insisted upon, however light the case. Exceptions to this rule are to be made only in the cases of young children.

The patient's *room* should have a sunny exposure, should be large and well-ventilated, though free from strong air-currents. The temperature need not be above 65° F. during the cold season, and the bed may be taken to a cool, shady nook on a porch or gallery during the warm season. The sick-room should be warmed by an open fireplace or by steam heat, in preference to furnace heat, which is unwholesomely dry. Furniture and hangings, unless needed, should be removed. I have never seen any advantage from the occasional removal of the patient's bed from one room to another, but communicating rooms are desirable, since they enable us to secure thorough ventilation of the sick-chamber by opening the windows of the unoccupied room and keeping open the door between the rooms. Perfect cleanliness of the room and of the utensils employed in the case should be attempted. (See Prophylaxis.)

The *bed* should be provided with a woven-wire mattress, upon which should be placed another mattress of hair. A rubber cloth is to be spread beneath the sheet, and it is important that the latter be kept smooth in order to lessen the danger from bed-sores. The seriously ill should lie on an air-cushion, or, better still, a water-bed. To avoid bed-sores the patient should from time to time be also instructed

to turn from his back to either side; the heels and hips should be bathed frequently with a mixture of alum and salt in dilute alcohol. The bed-clothing should be light. I am in the habit of recommending, besides the sheet, one or two thicknesses of woollen blanket, covered by a light counterpane. In summer a sheet usually suffices. The amount of covering should vary, in the same case even, with the changing sensations of the patient.

The mouth and throat should be kept clean, since by so doing we obviate unpleasant and often dangerous complications (aphthous ulcers, thrush, parotitis, inhalation broncho-pneumonia, etc.). In mild cases the patient can attend to this, but not in the severer types, when the nurse or attending physician should wash the mouth several times daily with a solution of boric acid (3 per cent. strength). It is well to spray the throat at equal intervals with a similar solution. Frequent moistening of the tongue, and particularly the lips, with glycerin and water in equal parts gives great comfort to the air-dried surfaces.

The nurse must not be allowed to leave the bedside of a typhoid-fever patient who has manifested the mildest delirium, since when left alone he may leave his bed and display even suicidal tendencies—a not uncommon cause of a fatal termination in cases where this rule is not made absolute. Although the nurse should be of a cheerful demeanor, she is to keep the room quiet and not converse unnecessarily with her charge. She should be instructed to offer the patient cold drinks in small quantities at short intervals, even though he fails to ask for them, since they are not only advantageous, but much relished. I find that ice-water (not too cold) is the most acceptable and perhaps the least objectionable. Lemonade, without much sweetening, and cold or iced tea are also allowable, and cold water, to which a little grape-juice has been added, is, I find, much liked by fever patients. The physician must instruct the nurse as to the number of visitors allowed and the duration of their stay. The profession must realize the very important fact that notwithstanding certain routine measures of treatment typhoid fever is a disease in which good nursing and constant watching are the factors on which chief reliance is to be placed. In this direction the kind aid of the conscientious trained nurse is of inestimable value. She alone can enforce the proper degree of rest; she alone can satisfy the patient's every want, and comfort him thereby; and she alone can protect him from injurious influences, thus averting many accidents and complications under the guidance of the competent physician. The facts embraced in a skilful nurse's report to the physician at his visits are often of greater importance to the latter in forming his judgment as to the condition of the patient than the results of his

own personal investigations, which must be made necessarily at intervals only. On the other hand, the nurse must not be allowed to indicate the medicinal treatment required, other than the simple measures which fall within her province in case of accidents or complications arising, but must report promptly such occurrences or unusual developments to the attending physican.

The Diet.—An appropriate liquid diet is highly serviceable, and the best article of food is milk. It is well to dilute it with water, and, if diarrhœa exists, it should be boiled. The daily quantity should not be less than 3 pints. No absolute rule can be laid down, however, some patients taking and digesting more than others.

It is best to examine the stools, and if curds or (on microscopic examination) numerous fat-globules are seen, the amount should be moderately restricted. If curds or fat are still seen, the milk should be peptonized. Experience teaches that milk is often better taken and better borne when a little brandy, coffee, or tea is added to it. When milk cannot be taken in sufficient amount, whey, skimmed milk, or buttermilk may be tried; also matzoon and koumyss. If these articles be distasteful, we may replace them (wholly or in part) by meat-juices, or broths of various sorts (beef peptones, beef-juices, or beef-essence, chicken broth, mutton broth, etc.), together with one of the standard infant's foods made with milk or water. The use of oyster soup, clam broths, and *consommé* is allowable, if relished by the patient. Albumin-water, prepared by straining egg-white through a cloth and adding an equal part of water, has given much satisfaction in my hands. This, with meat-juice and broths, will often support a patient during the most trying period of the attack. The food should be given regularly throughout in definite quantities and at stated intervals. With the onset of the period of decline the liquid nourishment is to be increased in amount. In light cases the patient need not be awakened if he can sleep at night, but in all instances he should be fed at intervals of two hours during the day, and when the quantity taken at each feeding is very small, nourishment should be given every hour. When milk is not the sole diet, the latter should be varied. Nurses should be told the importance of thoroughly but gently arousing the soporose or stupid patient before giving food, thus lessening the risk of aspiration pneumonia.

Rectal Feeding.—There are typhoid subjects who cannot (on account of vomiting, etc.) take *per os* sufficient nourishment to support life. Under these circumstances we may substitute or supplement the usual method of feeding by rectal alimentation. For this purpose peptonized milk (3 to 4 ounces—96.0 to 128.0), meat-juice (℥ss—16.0), and egg-white may be employed in combination at intervals of four hours. A stimulant may be added also if desired. In a

case reported[1] by me, in which vomiting was a frequent and distressing symptom, prohibiting the introduction of food by the mouth, the patient was nourished at times in part, and again for days together wholly, by *nutrient enemata*, making a good recovery. From the results of my experience in this and several other cases of typhoid I am persuaded that this mode of feeding may be the means of saving life, and that it deserves a more extended trial than has hitherto been accorded it by the profession.

In early convalescence the patient may take well-cooked plain rice, milk toast, entire eggs (diluted), or thin custards. These dishes should not be allowed until the evening temperature has been at the normal grade for one week at least. When defervescence is much prolonged and the patient becomes very weak, the administration of soft food (eggs, finely scraped meat, etc.) is often followed by notable improvement, and is a justifiable procedure. The return to a full solid diet should invariably be very gradual.

STIMULANTS are useful in most cases in the highest degree, but by no means in all. When the heart becomes enfeebled, as shown by the weak, frequent, and sometimes irregular pulse, with indistinctness of the first sound, alcohol should be used regardless of the temperature. In light cases this circulatory indication for the use of alcoholics is the only one presented, and is most apt to be met with at or near the end of the period of defervescence, but there are not a few cases belonging to this category in which no stimulation is required.

Cardiac weakness develops in all the severer forms, and occurs most frequently during the latter part of the second or in the third week of the disease. Nevertheless, at whatever stage of the affection alcohol is indicated, its administration must be promptly instituted. The same indication is invariably encountered in elderly typhoid-fever patients, to whom alcohol must (with rare exceptions) be given as a routine measure. The appearance of certain severe complications (intestinal hæmorrhage, peritonitis, broncho-pneumonia, lobar pneumonia, etc.) calls for the judicious exhibition of stimulants. I desire to direct special attention to the occasional occurrence of sudden collapse of the circulation, independent of intestinal perforation, in the course of typhoid fever, and the great importance of combating it promptly by quickly-acting stimulants.

When nephritis is a complication, I rely chiefly upon digitalis and strychnine as cardiac stimulants, giving alcohol with a sparing hand and only when the above agents fail. Slight febrile albuminuria does not constitute a contraindication to the use of alcohol.

For use in severe types whiskey is the best form of alcohol; in milder ones some good wine, as port, sherry, or madeira. It is well

[1] *International Clinics.*

to begin with a moderate daily quantity, and then increase if necessary, until the indications are fulfilled. If the patient so desires, he may use brandy instead of whiskey. Whilst alcohol is the best spur for a flagging heart, it is of equal value in combating unfavorable nervous symptoms, and the time for commencing its use may be indicated first by the presence of delirium, coma, tremor, twitchings, etc. To persons who have been previously addicted to their use stimulants should be administered throughout, and in a quantity that is to be regulated by its effects, which must be carefully studied in every instance. Their use in connection with the hydrotherapy of this disease will be pointed out in the discussion of this method. In the cases in which the indications are well marked I begin by administering whiskey, ℥ss (16.0), every three hours, in milk or water, and gradually increase both the dose and its frequency until ℥viij (256.0) or more are taken daily, provided its effects be favorable upon the heart and nervous system. Desperate cases may demand yet larger amounts. In rare cases the whiskey may act injuriously, causing aggravation of the symptoms; when it does it should be withdrawn and other forms of stimulants substituted. The above-mentioned threatened collapse may be met by full doses of whiskey ($\frac{1}{2}$ ounce every hour, or even more), combined with strychnine, which should be exhibited subcutaneously, gr. $\frac{1}{15}$ (0.0043), every three hours, till the depression has been in a great measure counteracted, and then should be continued in medium-sized doses, gr. $\frac{1}{30}$ (0.0021), every four hours. Still other cardiac stimulants are worthy of trial for their favorable supplementary action if required in the individual case, and among these are digitalis, sulphuric ether, etc.

SPECIAL MODES OF TREATMENT.

These are various, and, since to consider all of them at length would lead me beyond the scope of the present article I purpose to dwell chiefly upon (*a*) the method of hydrotherapy and (*b*) the symptomatic treatment—a combination of which methods I have employed for a number of years. Intestinal antiseptics are employed, but they form merely a part of the symptomatic plan. The use of this class of remedies does not, therefore, constitute a specific mode of treatment except in the imagination of their warmest advocates. The expectant-symptomatic method does not include here the routine administration of drugs for their prophylactic influence or to prevent the occurrence of complications, etc. The nearest approach to the constant use of a remedy will be found in the case of salol as a bowel antiseptic. As before mentioned, intestinal antiseptics are not entitled to rank as specifics, and this drug is neither given to modify nor to abridge the general course of the disease, but to overcome existing

tympany, and to control, so far as possible, abnormal fermentative processes in the bowel. Quinine is often combined to combat debility (*vide infra*). I shall speak subsequently of other special modes of treatment, though concisely.

Hydrotherapy.—There is at the present day general agreement among medical authors and clinicians that the best mode of treating typhoid fever is by means of the *cold bath*, which was originally introduced by Currie of London (more than a century ago), and reinstated and successfully practised by Brand of Stettin. There are obstacles and inconveniences in the way of carrying out hydrotherapy in private families, but since the convenient and inexpensive portable tubs have been devised by Batt and Furbush of Philadelphia, Burr of Chicago, and others, most of the valid objections to the method have been removed. At all events, the benefits to the patient offered by this method are so great and varied that it becomes the duty of every physician who treats typhoid fever to be prepared to employ it. The beneficial influences of the baths are as follows: (1) They absorb the body-heat directly, thus reducing the temperature and overcoming the ill effects of high fever; this effect is apt to become more marked after a couple of days, than at the start; (2) they improve the nervous symptoms and render the mind clear; they diminish mental dulness, stupor, muscular tremor and twitchings, and induce sleep; (3) they strengthen the heart, thus obviating the danger of sudden circulatory collapse and the consequences of increasing cardiac weakness (hypostatic congestion of the lungs, venous thrombosis, etc.); (4) they stimulate the respirations, whereby the inspirations are deepened and the tendency to pulmonary complications greatly lessened, especially severe bronchitis, lobular pneumonia, etc.; (5) the renal function is invigorated, and, as a result, the elimination of typho-toxins by the kidneys is increased (Roque and Weill); (6) on account of the cleanliness of the skin which they ensure bed-sores rarely occur; (7) they may shorten the stay in the hospital or sick-room, but not the stay in bed, except, perhaps, in the lighter types.

Unquestionably, the good effects of the Brand method receive striking confirmation from statistical reports which have been prepared by Brand himself, Jürgensen, and others abroad, and Baruch, Osler, Wilson, and others at home. According to the warmest European advocates of the method, the mortality is less than 5 per cent., and no deaths occur in cases that come under treatment before the fifth day. The results among American clinicians, however, have been less flattering, though strikingly uniform, and show an average mortality of 7.3 per cent. Of 102 cases of my own treated by cold and graduated cold baths, 8 died—a death-rate of 7.8 per cent. It is to be pointed out that strict Brand method demands the commence-

ment of the cold baths before the fifth day, this being out of the question in civilian hospitals, into which the cases are very generally admitted at a later period of the disease. It can, however, be followed vigorously in private practice (in some instances) and in military hospitals. The latter, according to Baruch, offer the only reliable statistics, because they are obtained from persons of the same sex and very nearly the same age, living under the same environments, eating the same food, doing the same work, rising and going to bed at the same hour.

Hence, while the statistical data of large general hospitals show the cold-bath treatment as giving far better results than any other known method of treatment, they are not a true criterion of the value of hydrotherapy in this disease. Prior to the use of the cold baths the lowest percentage of mortality (13 to 15 per cent.) had been obtained from the expectant-symptomatic plan. The latter, in my experience, constitutes a not unimportant part of the treatment in many instances in which hydrotherapy is practised, but where applicable it varies with the individual instance. I am convinced that the favorable effect on the case-fatality from the timely meeting of the symptomatic indications is usually underestimated, although it is manifestly of subsidiary importance to the cold bath.

The *details* which we will now consider connected with the administration of hydrotherapy are of the utmost importance. The tub is to be brought to the bedside of the patient, and in hospital practice both bed and tub should be screened while the bath is in progress. After removing his night-dress and placing a large napkin about the loins, the patient is lowered into the bath by a sheet held at each corner by an attendant (and, if he be seriously ill, with the least possible disturbance), and there carefully supported and held while in the bath. If he be sleeping, he must be wakened and the bath delayed for ten or fifteen minutes. Young subjects, and adults in light cases, may be handled properly by two persons, but I do not approve of allowing the patient to step from the bed into the bath, however light the case. While he is in the bath the skin surface, particularly that of the back and limbs, is constantly rubbed by the attendants, in order to stimulate the peripheral circulation and, as far as possible, to avert chilliness and discomfort. The head of the patient rests upon a rubber air-cushion. At first he should be kept in the bath from five to eight minutes; later, ten or fifteen minutes, according to the severity of the case. The head and face are bathed at once from a basin, and a cold compress is applied to the forehead. If prominent nervous symptoms be present, often associated with high temperature, water at 70° or lower should be poured from an elevation of about six inches upon the head and nape of the neck several times during the bath.

The ears must be stopped when douching is practised. If, while in the water, the patient complains bitterly of the cold or is very restless, a stimulant may be administered, ʒj (32.0) of whiskey, diluted, and if this fails he must be lifted into the bed and further stimulated. The patient is to be removed from the bath to the bed (previously protected by a blanket and mackintosh covered by a sheet) and wiped off gently, after which the sheet, blanket, etc. are withdrawn and he is covered with a blanket. If reaction be tardy, about an ounce (32.0) of whiskey should be administered and active friction applied to back and extremities. After reaction is established the patient should receive suitable nourishment. If he be very young, highly sensitive, or elderly, it is best to place him at the commencement in water of a temperature of 85° or 90° F., and then gradually cool it down to 80°. After he has become accustomed to the baths he may be immersed in water at the temperature of 80°, to be reduced to 75°, or even 70°, below which it is unnecessary to go save in the rarest instances. This is the gradually cooled bath of Ziemssen.

In the rigid Brand method, which is now generally adopted, and which I employ except in the instances above mentioned, the patient is lifted at once into the bath at 70° and kept there for fifteen minutes.

The effect of the bath is best shown by the rectal temperature, which is taken half an hour after the conclusion of the bath, and again half an hour later if the patient be not asleep. Usually, the temperature will be found to be two or three degrees lower than before the plunge. The subjoined charts enable a comparison to be drawn between the temperature-curve in a case treated by cold baths (Fig. 2) and that of another chart (Fig. 3) treated according to the expectant-symptomatic plan. The effect of the bath in producing a decided fall of temperature is noticeable, but about one hour after the tubbing the temperature begins to rise again, and reaches its former level, or almost, at the end of two or three hours. In obstinate and severe cases the fall may be less than one degree, in which case it is advisable to either prolong the bath to twenty minutes or reduce still further the temperature of the water. Protracted warm baths are highly recommended by Reisse and others when cold baths are badly borne or unproductive of good results. In light cases the cold bath should be repeated every six or eight hours; in severe ones, every three or four hours, but more frequently than once in three hours is not advisable even in the worst cases. Sufficient water to immerse the patient to the neck, about 30 gallons (79.2 litres), should be used. During the night the patient should be allowed to sleep for six or eight hours if he can do so.

As before stated, there are a number of convenient and satis-

factory portable tubs in the market, but that devised for me by Dr. C. L. Furbush of Philadelphia (see Fig. 4) possesses certain leading advantages. The frame is made of light wood, and when folded is 4 inches (10.156 cm.) in depth, 14 inches (35.546 cm.) in

FIG. 2.

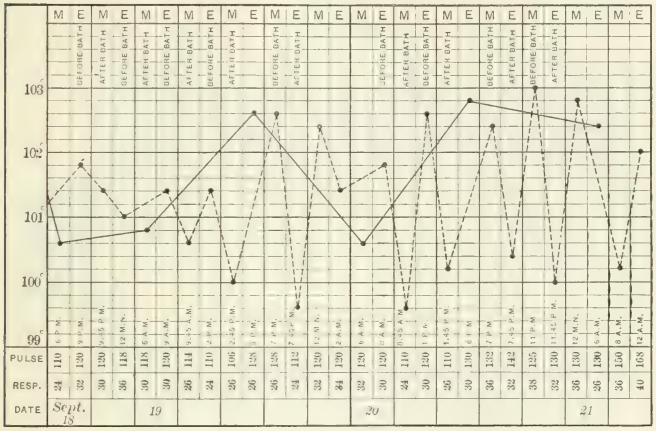
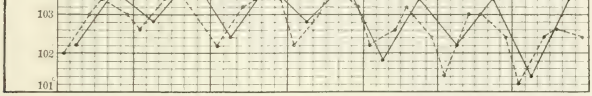


FIG. 3.

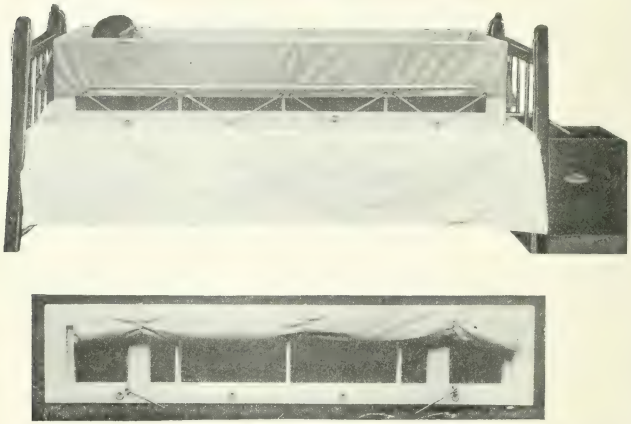


The dotted line indicates hourly temperature record. The solid line shows morning and evening temperature.

width, and 5 feet 10 inches (1.778 m.) in length, so that it can be placed in a closet or beneath a bed. Less than two minutes are required to prepare the bath, which the patient receives while lying in bed. When in use the ends are fastened by brass pins hung on small chains, and these hold the frame in a fixed position. The tub proper is made of double-faced sheeting, reinforced in the middle so as to resist the greatest amount of pressure. The sides of the sheet have a casing through which is passed a wooden rod 4 feet 11 inches long (1.049 metres), and outside of this a margin of $1\frac{1}{2}$ inches (3.808 cm.) is left for the brass eyelets, through which passes a rubber cord which is covered with woven cotton. This cord, which

is attached to the sheet, is held to the frame by special brass fittings along the lower sides of the latter. By the use of the cord and wooden rods we have an even tension on both sides combined with ample resistance to withstand the pressure of the water. An adjustable head-rest fits in the end of the frame. The wooden rod also enables the attendant to roll up the sheet quickly after the bath. Through

FIG. 4.



the bottom of the sheet a rubber 1-inch tube is fitted with a stopper, and by means of this the tub can be emptied much sooner than by a siphon. It is advisable to place two bricks under the legs at the head of the bed. The frame is covered with ivory enamel paint, so that it can be cleansed easily. The entire weight of the tub is 25 pounds (11.33 kgm.).

Whenever practicable, and when contraindications do not exist, baths are to be instituted and carried forward religiously, no matter how mild the case promises to be at the onset. Brand recommends that the baths be commenced when the temperature in the rectum registers 102.2° F. or over. The absolute height of temperature, *per se*, is not to be regarded as an absolute indication for its employment, since the fact must be remembered that the essential effect of the cold bath is a stimulation of the nerve-centres which preside over the organic functions (respiration, circulation, etc.), and that reduction of the temperature is the secondary effect. Moreover, cold baths exert a marked preventive effect, obviating serious symptoms and complications. I continue the baths at increasing intervals until the evening temperature remains below 101° F.

The contraindications to the use of the baths are—(1) *intestinal hæmorrhage*, which is in itself attended with danger, and requires absolute quiet for a time (about four days), when the baths may be resumed if there be no recurrence; (2) *peritonitis*, the occurrence of which always excites suspicion of perforation. Here, again, rest and all that the term implies must be procured; (3) *extreme weakness* of such a degree that the excitement or the handling of the patient necessarily connected with the bath might prove fatal, as I have witnessed in one instance; this condition is sometimes met with in cases that come under observation at a late period, have not been brought under proper treatment from the start, or in cases arising in the aged and in previously enfeebled subjects; (4) cases that have progressed to an *advanced stage* or the third week of the disease should not be immersed. Dangerous and even fatal collapse has been observed to follow cold baths under these circumstances.

Some claim, first, that treatment by the gradually cooled bath is a method entirely distinct from the Brand method, and, secondly, that it is in no wise comparable to the latter in its practical results. To the first of these statements I assent, but not to the second if the graduated bath be employed only in properly selected cases. My own results from the use of the gradually cooled baths have been quite as good as from that of the rigid Brand method when the cases have been chosen in accordance with the rules before laid down. It is true that the number of instances in which the method of Brand is applicable greatly exceeds that in which graduated baths are preferable. I am here simply pleading for the observance of that cardinal therapeutic axiom which recognizes the supreme importance of adapting the means to be employed to the case in hand rather than to the disease in general.

Substitutes for the Cold Bath.—The prejudice which exists against the cold bath—at least in America—sometimes proves insurmountable. Again, there are many physicians who do not avail themselves of the means at command for carrying out hydrotherapy. In consequence of these facts, substitutes for the cold and the graduated cooled baths, are, unfortunately, quite commonly in vogue. Among them cold sponging of the body of the patient is often resorted to, though it secures for him few and trivial advantages as compared with those of the baths. If this method be employed, the water should be of the temperature of the air of the apartment or ward. The limbs should be sponged and dried in succession, and then the trunk. Whenever the temperature reaches 102.5° F. this measure is to be substituted, each sponging being continued until the desired effect has been produced (a reduction of temperature of one and one-half or two degrees), unless the patient gives signs of uneasi-

ness, when it must be cut short. It may be repeated as often as required. To the water used for the application equal parts of vinegar or spirits should be added. The efficacy of the cool sponging is greatly enhanced by the simultaneous application of the ice-cap, either constantly or during alternate hours.

If this method fails, as it often does in severe types, the cold pack may form a satisfactory substitute. In children the reaction after a cold bath is often delayed and imperfect, and in these instances I have found the cold pack an excellent measure. The patient is placed upon a cot previously prepared by spreading over it a blanket, which is in turn covered with a sheet doubled and wrung out of water of the required temperature (70° to 80° F.). The sheet and blanket are now wrapped about the patient evenly, and he is there left for a period of time varying from a half to one hour. Free diaphoresis generally ensues, and this aids in maintaining the fall of temperature. The effect in most instances is to reduce the body-heat two degrees or more, and the treatment may be repeated at intervals of three or four hours if needful. The wet sheet alone may surround the patient, and be sprinkled at short intervals with a watering-pot containing water of a temperature of 70° F. Besides the mere reduction of temperature, the cold pack exerts a favorable effect upon the nervous system.

In desperate cases, in which cold baths are for adequate reasons out of the question, ice-water enemata may be tried. If carefully administered and not too large, not exceeding 12 fluidounces (384.0), they produce a reduction of the temperature amounting sometimes to two or more degrees.

Leiter's coils may be applied to the head, chest, or abdomen with the hope of lowering the body-temperature. They are made of thin rubber tubing, and form the most convenient mode of obtaining the good effects of cold.

Guaiacol when applied to the skin surface has a potent antipyretic effect, and has been extensively used by McCormick and others for this purpose in the treatment of typhoid. From 10 to 30 minims of the drug are used at each application. I have seen its use followed by unfavorable consequences—rigors, hyperpyrexia, etc.—and H. G. McCormick has adopted the rule not to use more than sufficient to lower the temperature to 100° F., and has thus escaped ill effects altogether.

The Symptomatic Treatment.—This is frequently useful, even in cases treated by cold baths, although often the remedies are needed only occasionally. It may rank as the leading plan of treatment when the Brand baths are not or cannot be carried out. (*a*) The *fever* may reach a high grade and demand treatment; unless the temperature, however, exceeds 104° F. and the morning remissions are

slight, special measures are not required. Hyperpyrexia (105° F. or over) is, if continued, dangerous, and calls for active measures. It must not be forgotten that a comparatively low temperature may very rarely be seen in grave cases. In such the system reacts less violently to the typho-toxins, hence the lower fever, notwithstanding the intense infection. When high temperature presents an indication for treatment, the choice lies between the two classes of agents—external and internal antipyretics. The former ("substitutes for cold bath") have been considered (*vide supra*), and deserve to be tried before the latter. But the substitutes for the cold bath often prove ineffectual, while internal antipyretics reduce the temperature, soothe and moderate the nervous symptoms, and act as more or less potent antiseptics. The most reliable of this group of medicaments (phenacetin, acetanilid, and antipyrin) are open to the serious objection that they depress cardiac power.

When the Brand method, however, cannot be employed, or when, as rarely happens, it is ineffective, and the so-called substitutes for the latter are unavailing, and there is present high fever with decided nervous symptoms, internal antipyretics are allowable if cautiously administered. The safest among them is phenacetin, of which about 5 grains (0.3240) may be given at a dose (preferably about 3 P. M.), and repeated after four hours should the first dose fail of the desired effect. Acetanilid is more effective than phenacetin, but it is not quite so free from injurious action as the latter. It may be prescribed in doses of 2 to 4 grains (0.1296–0.2592), to be followed by a second dose of equal size in four hours if necessary. Larger doses than the above are *attended with danger*, and are not any more effectual. The heart is to be carefully guarded by the use of stimulants when internal antipyretics are exhibited.

Symptoms presented by the Gastro-Intestinal Tract.—*Intestinal antiseptics* are much used with the purpose of destroying the bacillus of Eberth and to counteract the ill effects of its toxins. Unquestionably, they meet neither of these leading indications, but are obviously indicated in the treatment of an affection in which extensive intestinal ulceration and moderate tympanites are usual manifestations. The bowel antiseptic which I have employed quite extensively and with uniformally good results is salol, this drug being broken in the intestinal canal into carbolic and salicylic acids. It controls meteorism as nothing else had done in my hands. The dose is 2 to 3 grains (0.1296–0.1944) every three hours preferably administered in capsule. With it I combine quinine when prostration is well marked in doses of 1 or 2 grains (0.06–0.12) each for the tonic action. Henry speaks strongly in favor of thymol, which he prescribes in pill or capsule, gr. $2\frac{1}{2}$ (0.16) every three or four hours.

I have employed this agent recently, and with gratifying results, in a few cases in which a bowel antiseptic was indicated and in which debility was a prominent feature. Lactophenin, gr. 7 to 15 (0.45–1.0), in starch capsules, up to 1½ drachms (6.0) daily, according to the indications, is highly recommended (von Jaksch).

Turpentine fulfils in some cases a leading indication. When the tongue is dry and brown, the abdomen distended, the general prostration marked, and often muttering delirium present—symptoms of the typhoid state—the use of this agent, together with alcoholics, constitutes the best mode of treatment. Turpentine is best given in a capsule in the form of white turpentine, dose 3 to 5 grains (0.1944–0.3240), every three hours. Its routine administration, however, is to be unqualifiedly condemned.

Tympanites is sometimes a most distressing symptom, and is often associated with marked diarrhœa. It is usually pronounced when the lesions—catarrhal and ulcerative—are situated to some extent or in great part in the large bowel, which is the chief seat of the distention. There are two chief factors which produce tympanites : (*a*) diminution in the resistance of the intestinal and abdominal walls, and (*b*) decomposition of the intestinal contents, owing to lack of the antiseptic power of the digestive secretions. It is rarely so well marked as to interfere with the play of the diaphragm, but even when not excessive it accentuates the danger from perforation. As a remedy for tympanites turpentine is excellent. When employed for this purpose alone I prefer to employ it in the form of stupes applied over the abdomen, although turpentine enemata may also be given, since the gases in severe cases occupy chiefly the large intestine. The enemata may be repeated in ten or twelve hours, and if they fail to relieve a long rectal tube should be passed. Stimulants are, as a rule, indicated in these cases. The meteorism is often increased by the milk taken, so that it is well to predigest the latter. I have found that a change of food from milk to liquid peptones, meat-juice, and albumin-water cures some cases and helps others.

Hæmorrhages from the bowels, however slight, demand prompt and close attention, and complete rest must be immediately secured. The bowel movements, if the hæmorrhage has been copious, must be allowed to pass into the draw-sheet. The ice-bag (suspended if possible) should be applied to the right iliac fossa and ice held constantly in the mouth. Water is not to be taken in large quantities. Opium, to control paristalsis, is our chief reliance among medicinal substances. It should be administered in small doses at *frequent intervals, and by preference hypodermically* or by suppository, until its full physiological effects be secured. It may be combined with full doses of the acetate of lead to arrest the bowel movements. Cases in which slight

oozings appear from time to time are best controlled by the latter combination in pill form. In similar instances turpentine is quite efficacious, and it is also warmly recommended by many authors for use in copious hæmorrhages. Ergotin may be used hypodermically (to be repeated every hour) in severe bleedings. The amount of food should be greatly restricted for about twelve hours. The head of the patient should be lowered by removing the pillows, and the feet elevated by placing blocks under the foot of the bed. If the loss of blood has been excessive, a sterilized normal salt-solution may be introduced by hypodermoclysis, from 4 to 6 ounces (120.0–180.0) being administered at two to four different points.

Since the appearance of the blood in the discharges is preceded by notable fall of temperature, I instruct the nurse to discontinue the baths upon the occurrence of the latter event during the fastigium, and to keep the patient at absolute rest along with the use of the ice-bag until my next visit. Should the sudden depression of temperature be due to other causes, the usual treatment is resumed.

Collapse may follow severe intestinal hæmorrhage, in which case stimulants and other cardiants (strychnine, digitalis, ether, etc.) are to be used, the latter hypodermically. Artificial heat applied to the extremities is helpful.

Peritonitis.—When this complication is due to perforation of the intestine the patient in almost every instance passes quickly beyond relief, though recovery does rarely take place. Kind Nature, without or with the aid of the physician, may possibly limit the inflammation by the formation of adhesions. Morphine should be given hypodermically to relieve suffering, and the laparotomist should be called immediately. Operation offers little hope of cure, on account of the previous unfavorable general and local condition of the patient. With the progress of convalescence the chances of recovery from this accident improve. Peritonitis, due to direct extension of the infectious inflammation of the bowel without perforation, also occurs, and often admits of successful treatment. It is a complication which is difficult to recognize. Unless perforation be suspected, the physician is justified in administering saline purgatives, at the same time controlling pain by means of small doses of morphine, which is without harmful effects, save that it delays somewhat the recovery. Locally, ice-poultices or cold compresses may be used. Turpentine by rectal injection is serviceable if tympany is marked.

Diarrhœa, more than any other single symptom, claims special attention. Two to four movements daily do not constitute diarrhœa, and do not demand treatment. If this number of stools be exceeded, the condition should receive consideration. It may be caused by over-feeding or improper food—as shown by the stools, as a rule—

in which case regulation of the diet is curative. It is often due to catarrhal lesion of the intestines, particularly of the large bowel. Increased peristalsis of the small intestine alone, be it remembered, does not produce diarrhœa. Unquestionably, the use of proper intestinal antiseptics or such as possess the property of insolubility to a high degree is most valuable. Astringents may be combined with the latter or given separately. The subjoined formulæ have yielded better results in my own hands than numerous others which have been tried:

℞. Bismuthi salicylat., ʒij (8.0);
Beta-naphthol, ʒj (4.0).—M.
Ft. capsulæ No. xxiv.
Sig. One to be taken every two or three hours.

℞. Salolis, ʒj (4.0);
Bismuthi subgallat., ʒij (8.0).—M.
Ft. capsulæ No. xxiv.
Sig. One every two or three hours, depending upon the severity of the case.

Or,

℞. Plumbi acetat., gr. xxiv (1.60);
Extr. opii, gr. iss–ij (0.1).—M.
Ft. pil. No. xii.
Sig. One every three or four hours, as required.

The last formula may be administered in the form of a suppository, both ingredients being doubled in quantity. Late in typhoid fever, when the ulcers are fully developed, opium is the remedy *par excellence*, since it tends to arrest the peristaltic action, which keeps up the diarrhœa and favors the spread of the inflammation to the peritoneum. I have recently observed brilliant results in protracted cases in which diarrhœa was present from the use of rectal injections of an astringent solution (tannic acid, 1–2 per cent. strength), alternated with an antiseptic solution (salicylic acid, 1–2 per cent.), each given once daily at intervals of twelve hours. These, if administered cautiously and without much force, probably do not increase the liability to perforation, while, on the other hand, they seem to be followed by healing, as shown by the amelioration of urgent symptoms.

Constipation, which is often present, and particularly in the earlier stages, is to be relieved by simple small enemata of soap-suds in water every second day. This form of treatment is specially to be preferred after the ulcers have formed—*i. e.* at the middle of the second week. Calomel may be used in the early stages of dynamic cases. Its employment in this manner may be followed by symptoms

of milder type than are ordinarily encountered. Constipation may be occasioned by a diet which leaves too little residuum to provoke the normal peristalsis of the intestines, and a more voluminous dietary often overcomes the difficulty. The most extensive ulceration of the small bowel may coexist with constipation, the large intestines remaining inactive. This form is best treated by the enemata above described.

Vomiting is rare. Its chief cause is irritation of the gastric mucosa, which may be induced by improper diet or medication. In my experience the best measure for the relief of this symptom, after the removal of the causal factors, is the use of ice, taken in small pieces and swallowed. The oxalate of cerium, combined with the hydrochlorate of cocaine (in small doses), I have found very useful. Some mild form of counter-irritation in the epigastric region may be resorted to. Dry champagne may be given after other things have failed. If vomiting occur during the period of development and is due to the same cause, minute doses of calomel with bicarbonate of sodium may be instituted with good effect. Temporary restriction of the diet is advisable, or a change from milk to liquid peptonoids, egg-white, and animal broths. For the vomiting, which is rarely one of the ushering-in symptoms of the severest types of typhoid, nothing can be recommended with confidence. Two conditions which may cause vomiting in the course of the disease remain to be mentioned: (1) peritonitis, whose treatment has been described (*vide supra*), and (2) acute nephritis. The latter is prone to be a late-appearing complication. It is evidenced not alone by vomiting and other symptoms of uræmia, but by well-marked urinary phenomena (decided albuminuria and the presence of epithelial, granular, and bloody casts). The urine should, for obvious reasons, be examined at intervals of two or three days, although no attention need be paid to the slight febrile albuminuria which is frequently present. I discontinue cold baths when genuine acute nephritis supervenes. Excessive irritability of the stomach calls for absolute rest of the organ for a period of at least twenty-four hours, the patient being meanwhile supported by rectal alimentation and subcutaneous medication. (See also Diet.)

Nervous Symptoms and Complications.—Early in typhoid the *headache* may demand relief. Absolute quiet and cold to the head, however, frequently suffice, and menthol sometimes acts well. Depressant analgesics are to be avoided so far as may be, though it sometimes becomes necessary to resort to them; at such times those least objectionable are to be selected. I have found a mixture containing bromide of sodium, gr. x–xv (0.6480–0.9720), and the deodorized tincture of opium, ♏ij–v (0.1998–0.3330) in each dose, given at intervals of three or four hours, to exercise a strikingly happy influ-

ence. In occasional instances the above mixture fails, and then phenacetin, gr. ij–iij (0.1296–0.1944), may be substituted for the opium in the same combination or separately, in capsule.

Insomnia.—The cold baths or the measures calculated to relieve the headache often procure for the patient refreshing sleep. It is important not to allow the typhoid patient to go too long without sleep, since this tends to favor the development of a pronounced "typhoid state" and its serious concomitants. When the agents recommended for the headache fail, I employ morphine, hypodermically, in small doses, gr. $\frac{1}{8}$–$\frac{1}{6}$ (0.0081–0.0040), during the evening hours, with excellent results. I have yet to witness the unpleasant after-effects or the unfavorable influence upon the secretions that have been described by some authors. Codeine, sulphonal, and, more recently, chloralamid, have proven useful. Chloral is more certain in its action than the above agents, but I have abandoned its use for the reason that in two instances it apparently produced circulatory collapse.

Delirium.—Since the introduction of the Brand tub-baths delirium rarely calls for special medication. I have observed (in common with others), and particularly during the advanced stages, that in cases where circulation was feeble, and in which typho-mania was a prominent feature, the administration of stimulants with a free hand completely dispelled the nervous phenomena. If alcohol fails, ether, ♏x (0.666) at a dose, may be given hypodermically and repeated in one or two hours if required. To combine with the arterial some nervous stimulant (musk, valerian, etc.) will be found serviceable, particularly in cases in which the delirium assumes an hysterical type. Pure musk is an excellent nerve stimulant, and is best given in suppository, dose gr. v–x (0.3240–0.6480). Of special value in meeting the delirium are the bromides, hyoscyamus, the persistent use of ice to the head, and the other agents suggested for the headache and insomnia. Somnolence and stupor are rarely prolonged if cold baths and stimulants are appropriately employed. The cold douching spoken of in connection with hydrotherapy is capital in deep stupor or a comatose condition. Here also prolonged tepid baths, while cold is applied to the head, are worthy of trial.

Meningitis is an exceptional complication, usually developing later and even during convalescence. The measures of greatest value in its treatment are full doses of opium internally, and cold to the head. The extremities should be warmed. If constipation should attend, a mercurial purge, as calomel, should be exhibited and followed by an enema containing glycerin if it fails to act promptly.

Pulmonary Symptoms and Complications.—*Bronchitis* usually attends, but when it is confined to the larger tubes it is ordinarily

moderate, and special measures are entirely unnecessary. If severe and diffuse, its management, as well as that of broncho-pneumonia, to which it leads, are identical (*vide infra*).

Broncho-pneumonia was formerly (under the old régime) the most frequent pulmonary complication. The best means to prevent this are—(*a*) to keep the mouth cleansed; (*b*) to arouse the patient thoroughly before each feeding if somnolent, so as to prevent faulty swallowing; (*c*) to change from time to time the posture of the patient from the dorsal to either lateral decubitus; and (*d*) the use of Brand baths from the start. Should broncho-pneumonia be present, it demands free stimulation and the early and almost constant use of oxygen inhalations. Cold compresses or ice-poultices may be applied over the affected part or parts. The cold baths need not be omitted.

Lobar Pneumonia.—The treatment of complicating lobar pneumonia does not differ from that appropriate in this disease when secondary to other infectious diseases. If hyperpyrexia (105° F. or over) should arise, measures to moderate the temperature in accordance with the rules above laid down should be adopted. The heart's action must be maintained in the best possible condition, and the general nutrition as well.

Hypostatic congestion, when present, is caused chiefly by cardiac and vasomotor weakness, but to some extent it is determined by gravitation, as when the dorsal decubitus is too constantly assumed. The condition is often preventable. To overcome it, after its appearance the decubitis must be changed frequently, and cardiac stimulants freely given or increased in amount if taken previously. It is in this condition of the lung that ergot in full dose does excellent service, in that it raises the blood-pressure in the pulmonary area.

Laryngitis.—For this condition (which rarely develops in typhoid) counter-irritation should be tried, and, if this bring no relief, a small blister may be applied below the angle of the jaw on either side. For œdema of the larynx scarification and the inhalation of simple or medicated steam are measures to be used. Then, should suffocation become imminent, tracheotomy should be performed without delay.

Nose-bleed seldom requires treatment. Occasionally, when this symptom arises late in the course of typhoid, it is protracted and resists ordinary measures. Under the latter circumstances the posterior nares should be plugged before the patient's strength has been in great measure exhausted.

The Circulatory System.—The tendency at times to failure of cardiac power with general adynamia in this disease has previously been emphasized, and the treatment of the condition by measures calculated to sustain the heart and vital powers (strychnine, cocaine

hydrochlorate, ether, musk, etc.) has been indicated with sufficient fulness under the headings "Stimulants," "Intestinal Hemorrhage," and elsewhere. Cardiac complications—endocarditis, pericarditis, and myocarditis—are to be met on general principles.

Thrombosis of the femoral vein is best treated by elevating the part and keeping it at perfect rest. The following ointment may also be applied along the course of the vessel:

℞. Ung. ichthyol., Lanolin., āā. ℥ss (15.0);
Ung. belladonnæ, q. s. ad ℥ij (60.0).—M.
Ft. ung. Sig. Apply three times daily.

After the swelling has subsided an elastic stocking should be worn for a couple of months.

For *retention of urine* the catheter is used. The instrument must be kept thoroughly sterilized. In the female a glass catheter, and in the male one of soft rubber should be selected. That the timely and proper use of the catheter may obviate cystitis, and even nephritis, is, I think, indubitable. Should the latter, which are among the rarest of typhoid complications, arise, they are to be met by the ordinary remedies.

Management of Convalescence.—Some of the points connected with this subject have already been discussed (diet, time for getting up, etc.). I may add that should a recrudescence occur the patient should be kept at rest in the recumbent posture and a return made to the liquid forms of food. Often a moderate laxative serves a good purpose, particularly if an indiscretion in diet has been committed. The ulcers may not be healed, though the temperature may have been normal for a week or ten days, hence the patient should not be allowed to stir about for a period of two weeks after the temperature has returned to the normal. At first his movements should be slow; shortly he may be allowed to exercise gently in the open air during seasons of favorable weather, but mental excitement is to be avoided, since it may produce a recrudescence of fever. Occasionally during convalescence the diarrhœa persists. It is due to colonic ulceration, and is best treated by restricting the diet to milk and other light forms of albuminous food. The patient must be confined to bed. Medical treatment by the oxide of zinc internally, and the use of astringent and antiseptic rectal injections, as before indicated, usually proves successful. Constipation, which may be a troublesome symptom in convalescence, is best relieved by simple enemata. Most patients require tonics. We should begin with a vegetable salt of iron in combination with a simple bitter, as the *infusion* or the *tincture* of

gentian, etc. Later, an inorganic salt of iron with quinine and strychnine in capsules may be resorted to. If a predisposition to tuberculosis exists, cod-liver oil and creasote should be given for a period of a couple of months. Relapses and recurrences are to be treated as primary attacks.

Curative Inoculations with Cultures of Serum.—Among special plans of management this deserves mention. The brilliant results obtained from the use of antitoxic serum in diphtheria and certain other affections have led to attempts at curative inoculations in typhoid fever. But, though their specific virtue is yet to be demonstrated, it is deemed proper to state the results which have been obtained as concisely as possible. E. Fränkel and Manchot have treated 57 cases of typhoid fever with a sterilized liquid derived from the culture of the bacilli of Eberth in thymus bouillon and heated to 60° C. Of this one-half cubic centimetre was injected deeply into the gluteal region. No reaction followed the first injection. The next day one cubic centimetre was introduced into the other buttock. This produced an elevation of temperature with chilliness, followed in three or four hours by decided sinking of the temperature. The fever, however, rose again if the injections were now omitted. Oppositely, when the latter were continued at intervals of two days in augmenting doses (1 c.cm. each day), the fever assumed the remittent type, and disappeared altogether after a few days. The splenic enlargement and roseate spots, however, persisted.

Rumpf, following the methods of Fränkel as to preparation and administration, treated 30 cases of enteric fever with cultures of the bacillus pyocyaneus, with like results. F. Kraus and Bushwell, after treating 12 cases with the sterilized pyocyaneus bouillon, however, concluded that this method possessed no specific curative value.

Hughes and Carter treated a number of cases with blood-serum derived from convalescent cases, but, apart from a decided lowering of temperature, the general course of the disease was not perceptibly modified. More recently Klemperer and Levy have obtained the blood-serum from dogs (after inoculating them with bouillon cultures of typhoid bacilli), and found it to be capable of immunizing susceptible animals, as the guinea-pig, etc., against the potency of active typhoid bacilli, and of curing them when infected. This treatment was employed in 5 cases of human typhoid, all of which pursued a mild course.

Quite recently Pfeiffer and Kolle have shown the presence of a bactericidal substance in the serum of enteric-fever patients, as well as in that of certain immunized animals, but the results of their important researches have furnished a means of diagnosis of the disease rather than a specific means of cure.

Specific Therapeutic Plans.—The intestinal antiseptics have been entered, by some, under this head, but without the slightest clinical, or even theoretical, support. Combined with the use of intestinal antiseptics, eliminant treatment is employed. The latter consists in free evacuation of the bowels daily. So long as it can be shown that the typhoid bacilli do not grow and multiply or generate their poison in the intestines, but in the walls of the latter, in the mesenteric glands and the spleen, the futility of attempting to destroy the specific organism of the disease by the use of this class of remedies is obvious. As Osler pertinently remarks: "No one has been foolish enough yet to claim that the so-called intestinal antiseptics can kill the pathogenic and spare the useful organisms."

Drugs employed as general antiseptics for their specific virtue in this affection—iodine, chlorine, sulphuric acid, etc.—have all been found wanting, and scarcely deserve mere enumeration.

MALARIAL FEVERS.

Prophylaxis.

This embraces two considerations: (*a*) The destruction of the malarial parasites outside of the body, or the modification of the soil, so as to prevent further propagation of the latter; (*b*) Individual prophylaxis.

1. **The Destruction of the Malarial Parasites Outside of the Body, or the Modification of the Soil, so as to Prevent the Continued Propagation of the Latter.**—Attempts at the direct destruction of the parasites in the outer world must needs, in the present state of medical science, prove futile. But our knowledge of the conditions essential to the development of the malarial poison in the soil should, it seems to me, lead to the successful conversion of malarial into non-malarial soils. These conditions, so far as definitely known, are—

(*a*) *A Certain Degree of Humidity of the Soil.*—It is particularly the swamps that are overflowed at certain seasons and then exposed to the direct influence of the atmosphere, or, more specifically stated, to the *action of oxygen of the air* at certain other seasons, that are breeding-places for malaria. Marshy districts, affording luxuriant vegetation, are equally notorious as malarial foci.

(*b*) *The temperature of the air* is, *per se*, a factor indispensable to the development and multiplication of the malarial germ, since the plasmodium becomes inactive at a temperature below 65° F. On the other hand, plasmodial growths may be arrested by an exalted tem-

perature. Such facts as these explain why malaria is often confined to the lowlands and to estuaries and the deltas of rivers. They enable us to see clearly why certain districts which were formerly liable to the affection should have become, as the result of denudation of the virgin soil and its subsequent drainage and cultivation for considerable periods of time, entirely free from the disease; and, on the other hand, why the upturning of the virgin soil or removing the surface of the latter may be followed by the appearance of malaria in localities in which it has been previously unknown. Whilst the soil may be presupposed to be the natural "home and cradle" of the malarial poison, as well as the essential factor in its development, we are not acquainted, as yet, with all of the telluric conditions upon which its presence or absence depends. In this connection the fact should be emphasized that not all marshy districts are malarial, and again, that the disease has been met with in dry, sandy soils and even on distinctly rocky strata.

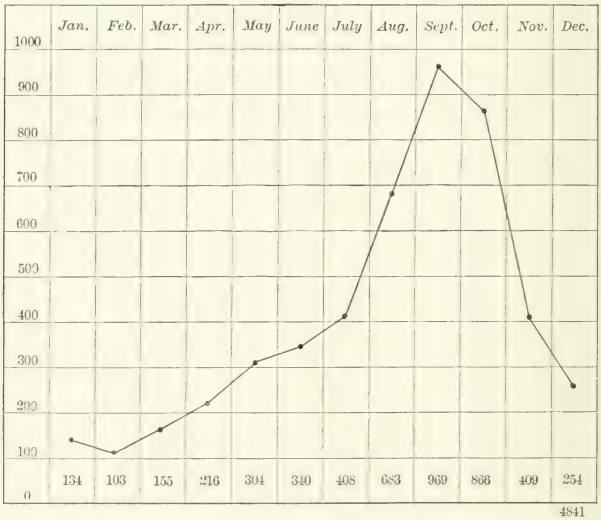
If the concurrence of the above-mentioned conditions is indispensable to the growth and multiplication of the malarial hæmatozoa, then necessarily if a single one of these be wanting the development of malaria becomes impossible. The question arises whether any natural or artificial modes of rendering malarious localities salubrious can be indicated. "Among the various devices which we owe to the ingenuity of man there is, perhaps, none to which attaches more importance than that of drainage."[1] The value of subsoil drainage, with the view of ridding highly malarial regions of their redundant moisture, can be proved by a consensus of eminent opinion, and in consequence of a full appreciation of this fact numerous hydraulic systems have been devised with varying though, on the whole, excellent results. To achieve the same happy object it has been recommended to plant trees, the number to be proportioned to the needs and extent of any special locality, on account of the extreme activity of the transpiratory function exhibited by growing vegetation and the consequent absorption of excessive moisture from the soil. "This application of a scientific principle is best adapted to soils having no natural subsoil drainage, as, for example, in marshy districts, under which conditions rapidly growing trees (eucalyptus globulus, etc.) have a decided effect."[2] There is much evidence of a practical kind to bear out this view. Swamps and morasses are frequent in Ireland, owing to the want of trees to drink up the superfluous moisture (D. Horwitz). In Algeria, according to the observations of Gimlet, extremely malarious districts have been rendered quite harmless in four or six years by the absorbent action of, and evaporation from, the leaves of the eucalyptus globulus. On the

[1] *House-plants as Sanitary Agents*, p. 65, by the author. [2] *Loc. cit.*, p. 263.

other hand, these favorable results have been obtained neither by the French, who have attempted large plantations of the Australian eucalyptus globulus in Africa, nor by the Trappist monks, who made similar trials in Italy. Perhaps the chief reason why seeming advantages were not realized in Africa and Italy lies in the fact that the eucalyptus is cultivated with great difficulty. There are many conditions of climate and soil in which its successful cultivation is impossible. It may be assumed, however, that convincing practical proof of the efficacy of trees in rendering human soil more wholesome is not altogether wanting, and, if not constantly, at least often, when plantations are properly and successfully made. It will be seen that the favorable influence of trees bears only upon one of the three conditions essential to the development of malaria—the reduction of the per centum of ground-water.

It is a remarkable fact that during a dry period following in the wake of a heavy freshet malarial outbreaks are both frequent and severe. This explains in part the constant and pronounced effect of the season upon the prevalence of malaria. Thus, in temperate lati-

FIG. 5.



tudes most cases occur in the autumn, the maximum number corresponding to the month of September.

This is shown in the accompanying chart (Fig. 5) by the tracing which is based upon 4841 cases of malaria gathered from the records

of the leading hospitals of Philadelphia. In the tropics the case seems to be different, as two maximal periods, spring and autumn, and two minimal, summer and winter, obtain. Autumn has, however, the greatest number of cases. If, as I have attempted to show elsewhere, forests preserve a uniform degree of moisture in their soil, there can be no gainsaying their effectiveness in securing more or less freedom from malarial infection under certain conditions. On the other hand and to an equal degree, the dense forests of the tropical regions, with their luxuriant undergrowth of humble vegetation and their thick covering of vegetable mould in a partial state of decay, render the soil more moist and tend to augment the danger of malaria. The bibulous humus overlying the soil forms an excellent receptacle for the malarial germ in districts naturally malarious, thus placing the plasmodium in conditions most favorable to the influence of the warm climate and the free oxygen of the atmosphere. This observation, although true in the case of the extensive tropical forests, is wholly inapplicable to districts influenced by the presence of plantations under proper care and regulations.

The Mechanical Effects of Trees and Forests in Protecting against Malaria.—It has been remarked by numerous observers that trees in belts or clumps, or even heavy shrubbery, placed between malarial localities and human habitations effectually protect from malarial affections. The wonderful unanimity of the observations recorded by physicians living in paludal districts proves this fact beyond peradventure. A familiar illustration of the influence of the forests in question may be cited here: "A few rows of sunflowers planted between the Washington Observatory and the marshy banks of the Potomac in the opinion of Lieut. Maury have defended the inmates of that establishment from the paroxysmal fevers to which they were formerly liable."[1] In Italy, Maury's experiments have been repeated. "Large plantations of sunflowers have been made upon the alluvial deposits of Oglio, above its entrance into the lake of Iseo, near Pisogne, and, it is said, with results favorable to the health of the neighborhood."[2] Another oft-quoted illustration to show the efficiency of trees as intercepters is the clearing away of the forest growth between the Pontine marshes and the city of Rome more than a century ago, at the request of Pope Benedict, and against the recalcitrations of Lancisci, whereupon a decided outbreak of malaria occurred in Rome, some portions of which became uninhabitable.

The question, "How is the effect in question produced?" is pertinent. The late Dr. Flint and Dr. Metcalfe believed that the malarial germ has a peculiar affinity for vegetable life, as well as for organic matter in general, and there is no doubt that the salutary influence

[1] *Loc. cit.*, p. 272.

[2] *Man and Nature*, by G. P. March, pp. 154, 155.

of trees and plantations is effected mechanically. The simple experiments by the late Prof. Tyndall afford a correct interpretation: "He found that the air of enclosed boxes at the expiration of three days no longer contained any of the microscopical particles invariably suspended in ordinary air, these all having attached themselves to the sides of the boxes. Into similar boxes he introduced different infusions of meat and vegetable, which for weeks and months remained unchanged, while, as was to be expected, when the same infusions were exposed to the general atmosphere they speedily underwent decomposition, becoming alive with bacteria."[1] If these observations show that minute air-borne matter has a general affinity for organic surfaces, it can be seen how vegetable growth, by intercepting the atmosphere currents laden with malarial hæmatozoa, would attract to itself the mites carrying the malarial parasites—a practical and mechanical operation.

2. **Individual Prophylaxis.**—To protect successfully from the hæmatozoa is in many cases impossible, and yet, by strict observance of certain rules, the number of instances of malarial fever can be greatly lessened. Of these the avoidance of exposure to the air at night is perhaps the most important. It is well known that the malarial poison is more virulent during the night than the day, and children as well as adults should be protected from its influence. They should not be allowed to go out of doors nor to enter malarial localities after nightfall. Exposure in general predisposes to infection by hæmatozoa, as is clearly shown by the far greater relative frequency of the disease among males than females. I have collected 5044 cases of malaria, which give the numerical proportion of 6 to 1 in favor of the males. On the contrary, it may be plausibly held that when men and women are equally exposed sex is without predisposing influence. Although the relation between the atmospheric humidity and the malarial organism is not definitely known, heavy fogs have been known to be particularly pernicious. Hence sleeping in second or third stories of dwellings is far safer than sleeping on the ground floor in malarial districts. This is accounted for by the fact that while the poison escapes from the soil into the atmospheric strata, it never extends far above the earth's surface, owing to the action of the law of gravitation. Farmers and laborers who must work in malarial localities should pass the nights in dwellings situated upon an elevation, however slight. Persons who are compelled to reside in a malarial district should be careful to select the most favorable site for residence. A high elevation even may protect successfully against paludism. If in a city, the highest points are least apt to suffer, and

[1] "Floating Matter in the Air," by John Tyndall, F. R. S., 1882, quoted by J. F. A. Adams, *Sanitary Forest-culture*, 1884.

densely-built portions enjoy greater safety than those more sparsely settled or than solitary rural homes, for the reasons mentioned in connection with the mechanical influence of trees and plantations. Residence on river-banks (which are liable to overflow) should be avoided. The popular notion that entrance into a mountainous region will cause dormant malaria to develop has been corroborated by physicians, and is an indication, according to H. C. Wood, that deposits are formed in the body. The precautionary measures above pointed out should be rigorously followed by those who have had previous attacks, in order to prevent relapses, which are exceeding prone to occur. The latter arise most frequently in the anæmic, poorly-nourished patients residing in paludal districts. Unquestionably, a generous dietary, along with improved hygienic details of living, is among the agencies most powerful to prevent malarial fevers.

Individual prophylaxis also embraces the use of quinine. Doubtless this remedy is no less potent in preventing malaria than in curing it. Among those who are obliged to live temporarily in malarial districts the use of quinine or cinchonine should be an invariable custom. That it is capable of preventing the development of chills and fever has been abundantly proven by practical observations made in the English navy, as well as by American army surgeons during the War of the Rebellion. The daily dose need not exceed gr. iv (0.2592) of quinine sulphate. Indeed, from personal observations I am convinced that gr. ij–iij (0.1296–0.1944), taken daily, will in most persons bestow immunity from malaria.

In Italy arsenic has been, and still is, much vaunted as a preventive measure. The results of practical experiments with arsenic, however, are somewhat discordant, and it may be safely concluded that it is inferior to quinine as a prophylactic against malaria.

Treatment of Intermittent Fever.

Spontaneous Cure.—At the outset the fact is to be emphasized that the human body possesses natural means of destroying the malarial parasite, and chief among these are the leucocytes. The latter not only accomplish the destruction of some of the parasites during the febrile paroxysms, but also ingest the disintegrated forms after the conclusion of the febrile attacks. Such facts as these go to show that perfect bodily nutrition aids the defensive processes of nature, while a lowered vitality actually hinders spontaneous cure.

Medicinal Treatment.—For the treatment of malarial fevers there is a true specific in *cinchona and its derivatives*. Whilst there are three official varieties of cinchona-bark—gray, yellow, and red—it sometimes happens that they are all derived from one and the same tree. The alkaloids derived from cinchona-bark are various (quinine,

cinchonine, quinidine, etc.), but of these, without question, the salts of quinine are the most certain in their action. As a consequence, quinine is to be given preference in all varieties of malarial fever—intermittent, remittent, continued, and irregular—and, although the substitution of one or more of the remaining alkaloids of cinchona may sometimes prove advantageous, this is only in exceptional cases.

The question "How does quinine cure cases of malarial infection?" needs to be answered. It is to be remembered at the outset that the specific organism causing malaria belongs to a sub-class of protozoa known as hæmatozoa, and that these run their cycle of development within the red corpuscles. The quinine acts directly upon the intra-corpuscular hæmatozoa. This can be observed outside of the body by mixing a drop of a solution of quinine sulphate with a drop of malarial blood. When this has been done it is possible to observe that the hæmatozoa rapidly assume degenerative forms (Laveran). On account of the fact that pernicious, intermittent, remittent, or continued forms of malarial fever—or, in other words, æstivo-autumnal forms—yield less rapidly to the influence of quinine than the simple intermittents, the different varieties would appear to have different degrees of resistance to the action of this drug.

When shall the use of the specific be commenced? There are many reasons, a few of which may be adduced here, why it is desirable to check the course of the disease as early as possible. In the first place, transmission of the simple intermittent into pernicious paroxysms may occur if the disease be allowed to remain untreated for a time. Again, malarial fevers, and particularly the autumnal forms, lead quickly to marked secondary anæmia, and especially so if the patient does not enjoy certain leading hygienic requirements—an abundance of food of good quality, fresh air, sunshine, etc. The blood-changes bring many other disturbances of function in their wake, and rarely initiate that grave blood-disorder, pernicious anæmia. At the present day the tendency is quite prevalent to delay specific treatment for the purpose of making search for the plasmodium, since there is no advantage in commencing the use of quinine during the first paroxysm. During this time the blood may be examined, and this is often needful to complete the diagnosis. Finding the case to be one of malaria, it is my custom to exhibit quinine at the close of the first paroxysm, so as to prevent a recurrence. If the diagnosis of intermittent malaria can be made with reasonable certainty at the physician's first visit, and he has not the opportunity to make a blood-examination at this time, the specific should be commenced at the close of the paroxysm if the patient reside in an infected district. The confirmation afforded to the diagnosis by the anti-malarial influence of quinine is almost

equivalent to finding the plasmodium in the blood, and obviates the ill consequences of unnecessary delay. Circumstances might, however, arise which would warrant a careful study of the blood. Fortunately, these cases occur in districts in which malaria is infrequent, and hence less likely to develop into the severer forms.

During the paroxysm of ordinary malarial intermittents the patient should be kept in bed. The first or cold stage demands plenty of covering and the application of heat externally for their placeboic effect. In the hot stage, cooling drinks, the ice-cap with cold sponging, and light covering are suitable measures. The skin should be carefully dried at the end of the sweating stage. It is only in rare instances that more than one paroxysm is witnessed if the treatment instituted be a proper one.

During the apyrexial interval the patient may be allowed to go about, provided that he is prudent and not too much debilitated. This is the period when the specific remedy is to be exhibited. I have found that a daily quantity of 16 gr. (1.0368) suffices to break the paroxysms in the cases met with in Philadelphia. In protracted cases, in severer forms, and in truly malarial regions the daily amount is to be increased to 20 grains or more (1.2960). Some administer the entire daily quantity at one dose from four to six hours before the succeeding paroxysm is expected, while others give it in divided portions. My own practice has been, in recent years, to administer the remedy in divided doses, and I have obtained more favorable results than with the single large dose which I formerly employed. Immediately following the "sweat" I administer 4 gr. (0.2592), repeating the same dose a few hours later, and the remaining 8 gr. (0.5184), or one-half the daily quantity, six hours before the next paroxysm, the object being to surcharge the blood with the parasitic antidote at the time when the hæmatozoa sporulate. Theoretically, then, the administration of one large dose, administered from four to six hours before the succeeding chill is due, would charge the blood to a greater degree at the required moment than if the same amount were given in three doses, as above recommended. But quinine is slowly absorbed, and still more slowly eliminated from the system. Formerly, when I prescribed single, large, daily doses, I observed not unfrequently unpleasant though slight toxic symptoms—tinnitus aurium, deafness, etc., and nausea even. These rarely arise under my present mode of administering the quinine. The treatment with quinine should not, however, be long continued after the paroxysms have been broken up, and the drug is best given in capsules, followed by a few drops of hydrochloric acid to aid in dissolving it in the stomach. Pills of quinine may be more convenient, and, if made with aromatic sulphuric acid, are equally efficacious, but not unless

freshly prepared. The specific may be also administered in solution, and in this form is more speedily absorbed. The latter, however, is often objected to on account of its unpalatability. When the sulphate of quinine, which is ordinarily employed, fails to give its usual happy results, the hydrochlorate or hydrobromate should be tried; and the latter salts possess two important advantages over the sulphate, in that they contain a larger percentage of quinine and are more soluble. After the paroxysms cease to recur quinine should be continued in doses of gr. vj–viij (0.3888–0.5184) daily for a few days. On the morning of the eighth day gr. x (0.6480) are to be given, and, if no chill occurs on that day, this dose is to be repeated on the fifteenth, and again on the twenty-second day. If the above dose fails, a larger one is to be administered on the latter two days.

Special Modes of Administering Quinine.—(1) *By Enema.*—If quinine cannot be taken *per os,* enemata containing the remedy may be employed. Each enema consists of gr. xxxvj (1.5552–1.6848) of quinine (adding sufficient tartaric acid to dissolve the latter) in 4 oz. of warm water. Rectal irritability is apt to be produced, however, and absorption is slow and often uncertain; hence this method of administering the specific is not to be advised, except in cases in which the stomach will not retain the drug, and in which, for some reason or other, it cannot be given hypodermically. The quinine enema must be preceded by a copious simple enema, in order to cleanse thoroughly the mucosa of the bowel. If the medicated enemata be ejected, a few drops of laudanum—*e. g.* ♏v–x (0.333–0.666)—may be added.

By Suppository.—It has long been and still is my custom to administer quinine in the form of suppositories to children who are unable to ingest capsules or pills. This is a more ready method than by enema, and in selected cases may be employed also in adults. In my experience it has not proved any more apt to excite rectal irritation than the quinine enemata. The hydrobromate or hydrochlorate should be chosen instead of the more insoluble sulphate. The dose should be one-third larger than when administered by the mouth, and of course its size must vary with the patient's age. For a child of five years I prescribe a suppository containing 6 gr. (0.3888). At least six hours must be allowed for absorption.

By Hypodermic Injection.—The anti-malarial effects of quinine can be quickly obtained by hypodermic use, and the drug is to be thus administered if there be no time for absorption from the stomach (four hours being the shortest period it is safe to allow), and invariably in pernicious types (*vide infra*). For this purpose the more soluble salts (hydrobromate, neutral hydrochlorate, muriate of quinine and urea, etc.) of quinine are to be preferred to the ordinary and less

soluble sulphate, which requires the aid of an acid to dissolve it. My own preference has been for the following solution:

℞. Quininæ hydrobromat., gr. xii–xv (0.7776–0.9720).
Glycerini pur., ♏ xv (0.999).
Sodii chlor., gr. j (0.0648).
Aq. destillatæ, q. s. ad ʒj (4.0).—M.
Sig. At one dose, to be repeated in pernicious paroxysms.

The subjoined mixture is also much employed:

℞. Quininæ sulphat., ʒss (1.9440).
Glycerini pur., ʒss (1.9440).
Acidi tartarici, gr. xv (0.9720).
Aq. destillat., q. s. ad ʒj (4.0).—M.
Sig. At one dose.

Kobner advocates the following:

℞. Quininæ hydrochlorat., gr. viii–xv (0.5184–0.9720).
Glycerini pur.,
Aq. destillat., *āā.* ʒss (2.0).—M.
Sig. To be injected lukewarm.

It is to be pointed out that unpleasant sequelæ, particularly in the form of abscesses, are apt to result from this method. By the observance of rigid antiseptic precautions, however, these can in a great measure be averted. It is of the utmost importance that the solutions used contain neither micro-organisms nor crystals, and that both the syringe and the skin at the point selected for puncture be carefully sterilized immediately preceding the operation. If the injection be made into the deeper subcutaneous tissue or into the muscle-structure itself, the likelihood of abscess-formation is lessened.

By Intravenous Injection.—This is the most rapid method of introducing quinine into the blood, but if we reckon the longer period of time required for the necessary preparations, little if any time is saved in comparison with the hypodermic method. The risk of serious consequences is also considerable.

The salts of quinine will occasionally fail, and then other preparations of cinchona may be tried. Among these cinchonine is the best substitute. Some contend that this drug has anti-periodic power almost equal to quinine. It is less expensive than the latter, although the dose is one-third larger, and I can speak with confidence of its efficacy after considerable experience in its use in cases where quinine has failed.

In protracted cases of intermittent malarial fever the salts of quinine and other preparations of cinchona sometimes lose their specific influence, when in moderate doses they are to be employed in combination with arsenic. This is especially true of quinine. The dose of arsenic, beginning with ♏ iv, t. i. d., of Fowler's solution, must be increased until the eyelids become decidedly puffy or albuminosity of the urine has been produced. I have found that a granule of arsenous acid may be administered in augmenting doses, commencing with gr. $\frac{1}{30}$ (0.0021), t. i. d., and increasing to the amount finally of gr. $\frac{1}{4}$ (0.0162) daily. So soon as the disease is under control the dose of this remedy is to be diminished, but the drug is not to be withdrawn for several days afterward.

Treatment of Pernicious Intermittents.—(*a*) **Prophylaxis.**—In nearly all instances the occurrence of pernicious paroxysms can be obviated by the institution of prompt and vigorous management. It is specially important to pursue such a course in seasons and localities in which this serious type is known to prevail. Under such circumstances to delay anti-malarial treatment until the second or third paroxysms occur in order to examine the blood is next to criminal.

(*b*) **Treatment of the Pernicious Paroxysm.**—The first attack is to be met promptly by the specific, which is to be administered by the hypodermic method (*vide supra*). In this manner the patient must be fully cinchonized and kept under the influence of the drug for several days, in order to prevent a recurrence, if we would rescue him from imminent danger to life. With the positive, unanimous opinion of English surgeons in India to the effect that no depletory form of treatment is borne in pernicious intermittents I fully agree. On the other hand, supportive measures, particularly vigorous feeding, and the timely use of stimulants when the heart's action becomes feeble, are to be urged.

The *diet* should be liquid, consisting chiefly of milk, animal broths, and egg-white. Liquid peptonoids, predigested milk, etc. may be resorted to as occasion demands. The food is to be given in definite amounts at stated brief intervals. When not sufficient nourishment can be introduced into the system by the usual route on account of the presence of gastric derangement (nausea, vomiting, etc.), which is often marked in these instances, then rectal feeding should be instituted. I have found a combination of the two methods of feeding, rectal and gastric, to work admirably in a couple of instances. I commence to use stimulants when indicated, by administering $\frac{1}{2}$ oz. (16.0) of whiskey or brandy, every two or three hours, augmenting the amount, if the action of the early doses be favorable, until the indication for their use is fully met. It is sometimes necessary to supplement the alcohol by other cardiac stimulants, viz. strychnine,

digitalis, sulphuric ether, etc. The latter are to be exhibited hypodermically.

There are certain other details to be carried out, though of relatively minor importance, and they differ with the varieties of pernicious fever. Thus, in so-called "congestive chills," in which the symptoms of vomiting and purging as well as those of circulatory collapse suddenly supervene, external warmth is highly useful. Morphine, in combination with atropine, administered hypodermically is also of great service, tending to allay the gastro-intestinal symptoms and to warm the extremities. Here, rectal feeding must be resorted to early.

In the **comatose variety**, in which marked nervous symptoms (such as active delirium, rapidly passing into coma) manifest themselves, the fact should be recollected that these alarming features are not due to cerebral congestion, but to the intensity of the infectious process. They are most successfully met by prompt and energetic anti-periodic treatment. Stimulants are to be given with a free hand, but only with a view to bridging the patient over the critical period, and never continuously.

There is a **hæmorrhagic form** of pernicious intermittent, which demands, in addition to the measures above recommended, the use of hæmostatics. In many of these instances malarial hæmaturia is the chief symptom, and its treatment is a therapeutic problem of unsurpassed difficulty, although the question would be much simplified if it were definitely known whether or not the quinine is the cause of the hæmaturia. Plehn,[1] Richardson, and others believe that quinine may produce this symptom, while Steudel and Küchel maintain that this remedy checks the development, and hence the injurious effects, of the malarial parasites. I have met with several instances of hæmaturia, in connection with the milder forms of malaria, in which no quinine had been taken, and have treated them with quinine (gr. xvj daily), a measure which successfully relieved the hæmaturia or hæmoglobinuria. When the latter symptom appears in the course of pernicious types of malaria, it is the custom among many clinicians to administer the quinine in heroic doses.

Two questions arise here: (1) May not the large amount of quinine act as an irritant to the renal tissues, exciting hæmoglobinuria? (2) May not the full doses paralyze the vasomotor nerves of the kidneys and in consequence congestion and hæmaturia supervene? It has been shown that under these circumstances a large quantity of quinine can be easily recovered from the urine. Doubtless, smaller doses of the remedy would often give equally satisfactory results without exposing the patient to added dangers. The specific treatment, therefore,

[1] *Berliner klinische Wochenschrift*, 1895, Nos. 25, 26, 27.

need not be abandoned in these cases, but I maintain that large quantities are not always necessary to effect a cure. Surely, the malarial parasite produces greater loss of blood within the circulatory system by its destructive action upon the red corpuscles than that which takes place through the kidneys. "In actual cases, the daily loss of red corpuscles in the vessels has been found equal to the direct abstraction of two and one-half pints of blood."[1] The cases in which quinine has exercised an injurious effect upon the kidneys have sometimes been those in which the remedy has been too long continued. This fact may be taken advantage of in the treatment of malarial hæmaturia, and the quinine discontinued so soon as the blood has been freed from the hæmatozoa, as shown by microscopic examination. These are the instances in which the interrupted method of administering quinine is to be recommended. Again, I am convinced that it is the part of wisdom to assist vicarious elimination from the bowels. This is the most rational explanation of the beneficial effects which have been derived from the use of calomel, saline purgatives, etc. In this connection the results of a collective investigation by H. A. Hare assisted by Wilmer Krusen are worthy of brief mention. They received 107 replies to questions which were sent out (the area covered giving an average death-rate from malaria of 70 per cent. or over), and of the thirty-two remedies used, calomel, in from 5- to 60-grain doses, seemed to be most in favor. Five other remedies used by ten or more physicians were tincture of ferric chloride, arsenic, ergot, turpentine, and sodium hyposulphite. Tincture of ferric chloride is employed either alone or combined with arsenous acid, or with small doses of quinine. Sodium hyposulphite may be given in from 20- to 40-grain (1.2960–2.5920) doses every three hours, after thorough purgation with calomel. Ergot is much employed as a hæmostatic. Of turpentine, 10 drops every three hours (in capsule), until the urine clears, may be curative, and turpentine liniment is often simultaneously applied to the lumbar region.

Treatment of Remittent Fever.

In this variety, a combination of anti-malarial and eliminant measures is essential. If the physician be called during the first exacerbation, a mild mercurial may advantageously be given at the outset, as follows:

℞. Hydrarg. chlor. mit., gr. ii–iij (0.1296–0.1944);
Sodii bicarbonatis, gr. x–xv (0.6480–0.9720).
Ft. charta No. j.
Sig. To be taken dry, on the tongue.

[1] *Medical News*, Sept. 7, 1895.

This is to be followed on the following morning by a saline laxative —Rochelle salts ʒij (7.776) in concentrated solution. The mercurial should not be given combined with quinine, but it may be repeated during the course of the individual case, as occasion requires. The process of elimination may sometimes be continued by the use of milder laxatives, such as bitartrate of potassium, ʒj–ij (3.888–7.776), in a glass of lemonade, or the patient may be allowed to drink freely of Saratoga vichy. During the exacerbation, cold spongings of the body, together with the ice-cap to the head, are serviceable. For the intense gastric oppression, nausea, and vomiting—when not relieved by the above-mentioned mercurial—chipped ice by the mouth, or small doses of cocaine hydrochlorate, either alone or combined with the oxalate of cerium, may be essayed. A mustard paste may be applied until the skin is slightly reddened, and repeated daily while the gastric features persist. The proper time to begin the use of quinine is during the first remission, and large doses are needed to secure cinchonism, such as gr. xv, to be repeated once or twice daily. The first dose may be given at 4 or 5 A. M., the second at 9 or 10 A. M., and the third, if necessary, during the early afternoon hours. In severe types, a fourth dose of the same size may be required. The object should be to obtain the full physiological effect of the remedy at the beginning of the succeeding exacerbation. If the stomach be non-retentive, or if absorption from this organ be too tardy, the quinine had better be exhibited by the hypodermic method (*vide supra*), or, if more convenient, it may be given by enemata. When the physician is called, after the patient has had one or more febrile paroxysms, the first indication is to establish cinchonism in any period of the exacerbation or remission. Says Bemiss, who has had a long and large experience, "I have seen excessive temperature abated, the dry skin become bathed in healthful perspiration, the tongue grow moist, the delirium cease, and the patient enter at once upon convalescence after a single saturation with quinine." In cases which do not yield to the sovereign remedy, pilocarpine in small doses, gr. $\frac{1}{8}$ to $\frac{1}{16}$ (1.0081 to 0.0108), should be administered hypodermically during the height of the paroxysm. Thus employed, pilocarpine has great therapeutic value: it increases the sweating decidedly, and in consequence renders the remission more marked and more prolonged. In a couple of instances I have observed a remittent fever thus converted into an intermittent one, with light and favorable course. The heart, however, must be carefully guarded when pilocarpine is prescribed, as this drug is an active cardiac depressant.

The remittent cases which have been allowed to drag on for one or two weeks often assume a typhoid character, and such cases are greatly benefited by the use of Warburg's tincture (*vide ante*).

It should be prescribed in doses of one-half ounce, three times daily in the average case, but the doses must be varied, according to the exigencies of the individual cases. After a lapse of several days quinine may be resumed and will be found to prove beneficial, or even curative.

Complications, including local inflammations, are not always controlled by the quinine, but require special measures, the choice of which may be left to the therapeutic judgment of the physician. The strong tendency to renal congestion and suppression of the urine is to be especially emphasized. The leading indication here is to bring about free diaphoresis, by the use of pilocarpine, etc., and cathartics, by means of saline laxatives. I have found, acting upon the suggestion of Page, that a combined steam and hot-water bath is most efficacious in these instances. The patient is placed in a tub of hot water, and then a blanket is put around his neck, its free ends being allowed to extend over the edges of the tub. This may be repeated, if necessary.

The diet should be simple, consisting of milk, meat extracts, or animal broths and the more digestible farinaceous articles. Cooling drinks are grateful, and their palatability may be increased by the addition of raspberry- or lemon-juice. Stimulants are rarely needed in remittent fever, until the stage of convalescence has set in, but in severe and previously neglected cases, indications for their use may be presented early. It is to be recollected that a weak heart calls for stimulants. Of these, brandy or whiskey may be employed, the commencing dose being one-half ounce every three hours. The effects are to be noted carefully, and if beneficial the quantity may be augmented when necessary. When the alcoholics fail, the use of strychnine and digitalis are to be combined with the former. They are best administered hypodermically.

Treatment of Malarial Cachexia.

As in other forms of malaria, so quinine is to be selected first in the treatment of malarial cachexia. It is not, however, to be administered continuously, but at stated intervals. While in charge of the out-patient service in the Episcopal Hospital, Philadelphia, I employed in chronic malarial cachexia and in protracted instances of malarial fever, with very satisfactory results, the sulphate of chinoidine, in daily doses of 30 to 40 grains. In this class of cases, Warburg's tincture (one-half ounce, three times a day) has also been warmly recommended. The eliminant method of treatment is to be combined, and an occasional, though small dose of calomel, followed by a saline laxative, is useful. During the intervals between the latter the milder aperients mentioned under Remittent Fever may suffice. My own experience warrants the belief that full doses of

quinine, given during alternate weeks, is the most successful mode of administering the specific. When this fails, arsenic, which is an especially valuable agent in chronic malaria, is to be added to the treatment. Fowler's solution may be used in augmenting doses, until the daily quantity reaches 30 or 40 minims—gr. $\frac{1}{4}$ (0.0162). If, however, puffiness of the face or albuminuria should appear, the dose should be gradually diminished to 5 minims, which should be continued for a considerable period of time. Another valuable agent is iron, and particularly its vegetable salts, which may be combined with a simple bitter. Few cases are curable, unless the patient leaves the malarial district forever.

For the malarial *anæmia*, which often attains to a severe grade, arsenic in increasing doses has yielded, in my experience, the best results. In a case at present under my care at the Medico-Chirurgical Hospital, the blood-count showed on admission 2,400,000 red corpuscles to the c.cm. Under increasing doses of arsenic, restitution of the red corpuscles was brought about with surprising rapidity; in a single week, while the patient took 8, 9, and 10 minims respectively of Fowler's solution after each meal, the count revealed an increase of from 2,600,000 to 3,500,000. The hæmoglobin, which had been reduced to 45 per cent., was, as is usual, regenerated more gradually. The patient was kept in bed during the first two weeks of his stay in the hospital. He had come from a malarial district in New Jersey. I have never been able to obtain favorable results from efforts at reducing the splenic enlargement. It may be mentioned, however, that iodine, in the form of tincture or ointment, is recommended to be applied over the organ. H. C. Wood advises, for internal use, the solid extract of ergot, in full dose—*i. e.* from 30 to 50 grains (1.944 to 3.240), a day, in capsule.

INFLUENZA.

By H. A. HARE, M. D.

Influenza is a term applied to two separate affections: 1. That arising as the result of infection by some agent as yet not discovered, and usually causing an epidemic of illness characterized by symptoms involving moderate or very severe suffering, and in its malignant types producing secondary affections of great gravity, particularly of the heart and lungs. This malady is true influenza, pandemic influenza, or *la grippe*. 2. The other condition is the general feeling of wretchedness with some aching of the bones or muscles which accompanies an attack of coryza or bad cold. It is with the severe, or epidemic and infectious, form that this article will deal.

In some cases, particularly during an epidemic, the differential diagnosis between true epidemic influenza, when moderate, and the ordinary cold in the head with systemic symptoms is difficult or impossible. Because of this difficulty many cases of "heavy cold" or congestion are classed as being instances of influenza since the great pandemic in the early part of this decade, and it is feared that many other cases, presenting as dominant objective symptoms aching in the bones, rigors, and fever, are diagnosticated as influenza when greater care might reveal that a very different cause for the symptom was present—as obscure tuberculosis, an early stage of enteric fever, or even malarial poisoning or one of the ordinary infectious eruptive diseases. On the other hand, it cannot be denied that since the great pandemic of influenza with which we were visited we see constantly single isolated cases or groups of cases presenting such typical forms of the disease that their identity with the pandemic variety cannot be gainsaid. Often these sporadic cases seem to be quite as malignant as the pandemic ones, and to leave the same vital alterations in tissue and function which that variety of the disease left behind it.

With the description of the general symptomatic picture of epidemic influenza no space will be consumed, for such a description is to be had in any work on practice, and almost every reader of this volume has by this time become familiar with the characteristic manifestations of the malady. However familiar we may be with the clinical aspects of influenza, we have as a profession to confess almost entire ignorance of its etiology and pathology, although its morbid

anatomy has within a few years become better understood owing to the sadly great number of deaths which this infection has produced and which have given us post-mortem findings. Even the autopsy has often failed to reveal any definite lesion peculiar to the disease in itself. In a large proportion of cases the cause of death is found to rest upon the presence of some lesion already existing in moderate degree before the attack of influenza, and which has suddenly become converted into a fatal malady by the development of this curious infectious process. Small and perhaps entirely unknown tubercular deposits in the lungs suddenly become rapidly advancing and fatal lesions; nephritis, limited in its severity, all at once develops into a variety which speedily ends the patient's life; and hearts which have been acting properly for years, although suffering from valvular or other lesion, suddenly break down from rupture of their compensatory hypertrophy. So common are these occurrences that it may be truly said that, while few cases die directly from epidemic influenza, a multitude succumb through the indirect effect of the influenzal poison upon those parts of the body whose vitality has been sufficiently impaired to render them susceptible to its influence. Even if a fatal result does not ensue during the attack it often follows soon after, or even after months or years we find patients stating that though their health had been perfect till the attack came on, they have never been well since. Their present state may be dependent upon some definite lesion in a vital part or be due to a functional disturbance of the heart or digestive apparatus, the cause of which an autopsy, even if it can be had, cannot reveal. The great pandemic of several years ago, like an angry sea, is casting up at the feet of the physician a long line of human beings maimed and permanently injured by the battle they have had with the waves of infection.

While from these facts, and the lack of knowledge as to the cause of the malady, it is evident that our therapeutics when directed to the cure of influenza cannot be very rational, it is also evident that the proper guidance of the patient through his acute illness is of double importance, first, because some serious complication may suddenly end his life, and secondly, because even if he recover from the acute stage he may be so wrecked in health afterward as to be useless to himself and his family. In other words, the physician who is called to see a case of influenza, whether it be of the moderate or the severe type, should never forget that his patient is in some danger, and that his case must receive more watchful attention than that of one suffering from almost any other malady presenting the mild manifestations often met with in this disease. Further, these mild cases, because of an insidious action of the influenzal poison or because of lax care and treatment, are often followed

by the more severe after-effects. The editor of the London *Practitioner* well expressed the necessity of regarding all cases of influenza as worthy of our greatest skill when he said: "One lesson we have learned [about influenza], and that is to avoid the mistake which has too often brought British troops to grief in our little wars, of undervaluing an enemy."

The brusque onset of some cases of influenza and the gradual onset of others may raise suspicions of some other acute infection or even of acute toxæmia on the one hand, or of enteric fever on the other. Often a patient feeling almost as well as usual will be seized with a severe chill amounting in violence to a rigor, and this is followed by violent aching in the back, in the loins, and in the limbs, or throughout the entire body, and a gradually increasing feeling of malaise causes him to seek medical advice. In both classes of cases the febrile movement is usually marked.

In all cases, be their character what it may, one invariable routine measure should at once be insisted on and maintained from the beginning to the end of the attack, and indeed until convalescence is well established, namely, absolute rest in bed.

As already pointed out, the complications of influenza are its most dangerous features, and these complications are usually those which involve the heart, the lungs, or the kidneys. The first of these organs will, in its condition under the infection, be very readily rendered weak, feeble, and irregular if the erect position is maintained and exercise is taken. The other organs are peculiarly susceptible to congestion and inflammation resulting from the chilling of the blood in the relaxed peripheral vessels by the exposure to cold air or even the air of the room. By far the largest number of fatal or severe accidents in true influenza result from ignorance of this important matter of rest and the avoidance of exposure to cold. By remaining in bed the skin is kept warm and aids the kidneys materially in eliminating toxic matter, while its suffusion with blood tends to diminish internal congestion. If a patient refuses to take such rest the physician should at once relieve himself of all responsibility of untoward results by explaining to the patient and his friends the foolhardy risk which the patient is running.

Once the patient is resting in bed the therapeutic rule which the writer of this article is constantly impressing upon the students who attend his lectures holds with force in regard to the function of the attending physician from the beginning to the end of the attack, namely, that "the physician is to be a watchman all the time and a therapeutist only when occasion arises." The old saying, "When in doubt give squills" is capable of producing no good and much harm, but on the other hand, any symptom sufficiently annoying in itself to

merit relief, or any manifestation that any part of the body is suffering from functional disorder of a serious nature, should demand active interference. Just as long as the patient lies fairly comfortably in his bed no other medicine need be given him than small doses of sweet spirit of nitre and citrate of potassium as a diuretic mixture to maintain free urinary flow. If the chill persists after the patient is put to bed hot blankets and hot bottles may be placed around him, and, if it is thought wise, he may also receive a glass of hot lemonade with or without the addition of a little alcoholic stimulant. If the patient is robust and the nervous symptoms are markedly those of excitement, sedatives may be resorted to, both for the nervous symptoms and to stimulate the circulatory apparatus. Thus 5 to 10 grains of Dover's powder may be given, or a little bromide of sodium with some quinine (4 grains) and perhaps a little acetanilide (2 grains). This may be repeated, leaving out the Dover's powder after the first or second dose, if it is desirable owing to the excitement and fever persisting. If constipation is present and the bowels have not been freely moved the Dover's powder should not be given, but a dose of calomel be used and followed in about five hours by a saline purge, after which the remedies suggested just above may be resorted to. The bromide, acetanilide, and quinine may be given every six or eight hours for a day or two, and then it is usually better to discontinue them. Large doses of quinine such as are often given are entirely useless, and commonly increase the discomfort of the patient very materially by reason of the cinchonism which they produce. Further than this, full doses of any of the drugs already named, save calomel, are usually hurtful in that they do not produce any better effects than small ones and are apt to disorder digestion and increase the work of the laboring and perhaps congested kidneys in an effort to eliminate them. This matter of maintaining free kidney secretion cannot be overestimated, both for the sake of the general economy and the kidneys themselves.

As additional measures for the relief of pain and fever the patient may be subjected to a hot or cold pack (see Volume I.), or in its place he may be sponged off with tepid water and alcohol, accompanying the sponging by active frictional rubbing of the tender muscles. In other instances rubbing the back and limbs with chloroform liniment will prove very efficacious, or the following familiar formula may be used for this purpose:

℞. Tinct. aconit., fʒiv (16.0);
Tinct. belladonnæ, fʒij (8.0);
Tinct. opii, fʒiv (16.0);
Liniment. camphoræ, q. s ad fʒvj (180.0).—M.
Sig. Poison. For external use only as directed as a liniment.

If the patient is feeble and depressed, not only hot stimulating drinks should be given him, but in addition some stimulant and sedative mixture, such as the elixir of guarana and celery in the dose of 1 to 4 teaspoonfuls every six or eight hours after taking some nourishment, may be administered. This will relieve headache and neuralgia and stimulate the heart, respiration, and kidneys. Some practitioners use salicin, alone or guarded by a little caffeine or strychnine, for the painful symptoms of the disease. The dose of the former should be 5 to 10 grains three times daily after food, and of the caffeine 1 to 2 grains at the same times.

Sometimes from the very first the patient is so depressed that all other symptoms than his feebleness sink into insignificance and every effort must be used to increase his flagging energies. For this purpose the most valuable remedies are strychnine, caffeine, coca in the form of a good coca wine, kola, and the alcoholic stimulants. Should the general feebleness be alarming and pressing, any of these active agents may be given hypodermically, or, in the case of coca, cocaine may be substituted or ammonium carbonate or aromatic spirit of ammonia given by the mouth. If the heart is feeble and acting irregularly, the use of Hoffman's anodyne is indicated.

It has been the custom of many to give these rapidly acting and powerful stimulants almost constantly from the beginning to the end of the illness. It does not seem to the writer that this is good therapeutics—save, perhaps, in the case of alcohol, which adds force to the body. All these stimulants are in reality spurs which goad the system to make some sudden vital effort. Frequently repeated, they exhaust the vital forces by repeatedly calling upon them, they obtund the reactive abilities of the system, and when a crisis comes, in which the patient must rally all his forces in order to recover, every stimulant has been used, every power has been exhausted, and the result is disastrous.

On the other hand, in the ordinary varieties of depression that we meet with in acute influenza, digitalis has seemed in the writer's hand to possess little value. Indeed, aside from pneumonia there are few acute maladies of the general system in which this drug is valuable. It is a slowly acting heart-tonic.

Diet.—The main factors aiding recovery in the class of cases just described are the digestive function and the maintenance of nutrition. If stimulants are given constantly they should be used more for their local influence upon digestion and assimilation than for their general systemic effect, and should always be given with food and well diluted. If the strength can be preserved by the use of good, nutritious, easily digested food, the chances of the patient are in every respect greatly improved. Concentrated liquid broths made from mutton, beef,

chicken, and veal, to which have been added well-boiled rice or barley strained or made into a pulp, should be given. As little heavy food as possible is to be permitted. The use of milk, while of great service in some cases, should not be pushed in those who have a heavily coated tongue, as it will only cause indigestion; neither should the use of meat broths be persisted in if there is present any active diarrhœa. Acidulous drinks, as of lemon-juice and water with very little sugar, may be given, or barley-water, rice-water, or albumen-water be resorted to, to allay thirst, to soothe the stomach, and to flush the kidneys. One of the most important things in the way of drink is Vichy water from the Celestin spring, or Poland or Londonderry water if the imported Celestin water cannot be had.

Complications.—The treatment for the average, moderately severe, case of influenza from the beginning to the end of the attack, except so far as complications are concerned, has now been considered. Attention has already been called to the fact that these complications are to be avoided by a strict prophylaxis at the beginning and during the attack to its end, including convalescence, and, if the patient is obedient to his physician's directions, in the large proportion of cases he will progress to an early and rapid convalescence. Should he, however, be careless as to these directions, and subject himself to exposure which under ordinary circumstances he would consider no exposure at all, he may at once fall a victim to various complications, single or multiple, any one of which is often sufficiently malignant to cause his death. As an illustration of the rarity with which influenza itself produces a fatal result we may call attention to the interesting fact already emphasized by Bertillon and quoted by Atkinson, that during the epidemic of influenza in Paris in December, 1889, and January, 1890, the deaths from influenza numbered but 213, while the general mortality exceeded the average by 5500; and again, the statistics of Pepper, which show that during this epidemic in Philadelphia only 116 deaths were reported as due to influenza, although the mortality rate of the city rose at a bound to 3044. Pepper only found 84 deaths due to uncomplicated influenza in 35,413 cases. These figures illustrate very well the fact that the complications of the disease are in many instances so severe as to completely mask the true cause of the affection and to convert the case from an ordinary one of influenza into a grave pneumonia, or an equally serious disease of the myocardium.

Probably the most common complication of the ordinary case of influenza is *bronchitis*. Almost always, but not invariably, there is in the early stages of this affection a certain amount of inflammation and irritation of the upper air-passages which, at the first opportunity,

is apt to extend to the larynx and trachea and thence to the bronchial tubes. If a bronchitis is developed the treatment ordinarily instituted for this affection must be resorted to, save in this important respect—that as a rule all sedatives to the nervous and circulatory systems are contraindicated, since at this stage of the disease the asthenic manifestations of the influenzal infection are usually prominent. For this reason antimony, aconite, veratrum viride, very large doses of the potassium salts and of ipecac are usually inadvisable, and the physician in the early stages of the bronchitis must rely chiefly upon the inhalation of medicated vapors or medicated steam, the use of counter-irritants over the sternum and between the shoulder-blades, the rest in bed that we have already insisted upon, and the administration of hot drinks, or a Dover's powder, for the purpose of producing relaxation of the skin and causing a certain amount of perspiration.

If the bronchial inflammation is once thoroughly established and the stage of secretion is developed, then the various stimulant expectorants are as valuable as they are in the ordinary case of bronchitis, notably such drugs as the chloride of ammonium, the various balsams, as for example oleoresin of cubebs and copaiba, terebene, the oil of sandalwood, and similar substances. Should the cough at any stage be excessive, small doses of codeine are probably the best means of controlling it, but later on in the attack, whether the secretion be fairly profuse or not, it has been the experience of the writer that the oil of sandalwood in 5-minim capsules, given in the dose of one or two capsules three times a day—that is, every eight hours—are most efficacious in relieving the cough and aiding in the expectoration.

Very rarely will there be any serious impairment of cardiac power in such an attack of bronchitis, but should there be an extension of the inflammation to the smaller bronchial tubes, with the development of broncho-pneumonia, the case at once becomes very much more serious, not only because of the condition of the pulmonary apparatus, but also because these cases are very apt to develop more or less serious symptoms, which in some cases seem to be almost purely functional and in others apparently rest upon serious changes in the cardiac ganglia and myocardium. It is in such a case that the greatest skill of the physician is required, for very frequently a condition of profound adynamia is developed from which it seems impossible to arouse the patient. It is at this time that full doses of strychnine given for a day or two seem to produce a most beneficient result. Under these circumstances this drug should be given freely, and usually hypodermically. It may be assisted materially by the simultaneous administration by the mouth of moderately full doses of aromatic spirit of ammonia, well diluted with water. As much pre-

digested food as the patient can assimilate should also be given. Oxygen inhalations often seem advantageous and sometimes sharp counter-irritation over the portion of the lung which seems to be most involved, by means of a blister—or, better still, by a dry cup, never a wet cup—produces good results. If the condition of cardiac feebleness persists digitalis may also be given, but the presence of much fever renders its administration almost futile. Should there be little secretion in the bronchial tubes and great restlessness with nervous jactitation, morphine may be given, by the mouth or hypodermically, for the purpose of producing sleep and giving the patient the much-to-be-desired rest, but should the bronchial secretion be profuse the administration of morphine may result in the development of a considerable amount of cyanosis by the arrest of the cough and the consequent decrease in expectoration.

The physician who is on the watch for *pulmonary complications* in influenza will often find that at the base or apex of one lung there is an area in which the physical signs of pneumonia are quite marked; the patient in addition may be expectorating the characteristic rusty or bloody expectoration which is sometimes seen in croupous pneumonia. But he will be surprised to find at the end of twenty-four or forty-eight hours that the area previously diseased seems to have cleared up, and that another spot at a considerable distance from the original site has apparently become involved in the same process. In other words, the patient seems to suffer from fugitive pulmonary congestions. Whatever their actual pathology may be, clinically we meet with many such instances in practice. They are usually associated with feeble cardiac action, and require active stimulant treatment such as we have already described.

In some cases the pulmonary system entirely escapes the results of infection, and the *heart* alone is infected. The cardiac affection may manifest itself by great tachycardia, or in other cases by slowing of the heart's action. Perhaps more commonly still this viscus suffers from an arrhythmia evidently dependent upon some disturbance in its nervous government. Or it becomes exceedingly feeble in its action, is easily perverted in its function by any movement upon the part of the patient; and to such an extent may this cardiac disturbance develop that any effort to lift the head from the pillow results in threatened or complete syncope. Here, again, the physician must be most cautious in his handling of the patient. All movements calculated to throw an extra strain upon the heart must be absolutely prohibited, for it would seem probable that the nervous ganglia of the heart in such a case are affected very much as they are in some cases of diphtheria, in which a sudden movement may result in the instant death of the patient, while complete and prolonged rest often results

in complete recovery. Many of the cases of cardiac disturbance following influenza seem to depend for their continuance upon the fact that the patient has gotten out of bed, or exercised, before recovery from the acute cardiac disorder has been complete.

For the tachycardia the writer has usually found that some one of the following prescriptions give the best results, according to the condition of the cardiac muscle. If the muscle seems sufficiently strong and its action is irregular the following may be given:

℞. Tinct. aconiti, ♏xxiv (1.6);
Tinct. belladonnæ, ♏xlviij (3.0);
Tinct. digital., ♏xxiv vel xlviij (1.6–3.0);
Tinct. gentian. comp., q. s. ad f℥iij (90.0).—M.
Sig. A teaspoonful every six or eight hours—that is, three or four times a day.

In this prescription we get the regulating influence of digitalis, but its stimulant influence upon the heart is largely set aside by its antagonist aconite; the belladonna acts as a vasomotor and cardiac regulator and sedative, and the gentian acts as a simple bitter tonic to the stomach and as a vehicle for the more powerful remedies.

If the heart seems to be lacking somewhat in strength and also suffering from arrhythmia, the following may be used:

℞. Tinct. strophanthi, f℥j vel ij (4.0–8.0);
Tinct. cactus grandifloræ, f℥j vel ij (4.0–8.0);
Tinct. belladonnæ, f℥ss vel j (2.0–4.0);
Tinct. gentian. comp., q. s. ad f℥iij (90.0).—M.
Sig. One teaspoonful every six or eight hours.

Or in some instances it may be well to supplant one of these ingredients by the tincture of nux vomica, or to add the latter to the prescription given above. In still other instances the tincture or fluid extract of convallaria may be used as a cardiac regulator. Should there be marked valvular disease of the heart, larger doses of digitalis are advisable, provided that compensation is ruptured. Further, alcoholic stimulants are particularly useful in this class of cases, but the danger of developing the alcoholic habit is not to be forgotten, and the same objection stands in the way of administering coca and similar stimulants continuously. A belladonna plaster applied over the heart in many cases of cardiac arrhythmia following influenza is of great advantage, and in very severe cases an ice-bag applied to the præcordium is very beneficial for the same purpose. Should the kidneys be impaired and the urinary secretion scanty, small doses of gin,

from one to two teaspoonfuls, given every three hours, may be advantageous.

Should severe *diarrhœa* become a dangerous complication in influenza it must be controlled by the ordinary measures which are employed for this condition.

Quite commonly during the attack and particularly in convalescence from influenza, the patient suffers from various *nervous symptoms*, of which the chief one is perhaps insomnia. By far the best remedies for this condition are the avoidance of all business worry and care, the constant leading of an out-door life, as much horseback or other moderate exercise as can be resorted to within reasonable limits, the use of hot and cold douches as described in Dr. Baruch's article on hydrotherapy, and, last and perhaps least from the point of advisability, we may give the patient various hypnotic substances, of which probably the best for such cases are chloral, trional, and sulphonal. Hyoscine has been recommended for many of these patients, but it probably is limited for its greatest benefits to those who have a tendency to mental delusions in addition to their insomnia.

During convalescence from influenza the patient should be subjected, in those cases where the attack has been very severe, to a complete or modified rest cure, followed by gradually increasing exercise in the fresh air—if possible, at some health-resort. All nervous or mental strain should be avoided and every effort made to conserve the vital energies of the patient until convalescence is ended and perfect health regained. There can be no greater mistake upon the part of such a patient than to make a too rapid return to the ordinary pursuits of daily life, and there is probably no instance in medicine in which the motto *Festina lente* finds a better application than in convalescence from the disease the discussion of which we have just concluded.

(Remarks in regard to Influenza from the standpoint of the rhinologist and laryngologist will be found in Dr. Ingals' article on page 163.)

SCARLET FEVER AND MEASLES.

By H. A. HARE, M. D.

SCARLET FEVER.

The treatment of scarlet fever consists in its prophylaxis, the management of the case during the different stages of the malady and of its complications, and finally, the methods by which its sequelæ are to be combated.

Scarlet fever is, as is well known, one of the most infectious of the exanthemata, and (now that smallpox has been so nearly conquered by vaccination) there is no other of the eruptive fevers which is so much dreaded; for typhoid fever is not infectious except by fomites, and typhus fever is very rarely seen in ordinary practice. The preventive treatment or prophylaxis of scarlatina is therefore of immense importance.

The first measures in the event of an outburst in force in any given district is to close the schools, to forbid large festive gatherings of children, when one infected child often infects a multitude, and the isolation not only of the sick, but also of those who have to the physician's knowledge been exposed to infection. These are the hygienic rules which should govern the general population.

The special rules for the prevention of the spread of the epidemic by the careful management of the sick individual have yet to be considered. In addition to rigid isolation the greatest care should be taken that the child's attendants are not allowed to mingle freely with the rest of the household. One or two capable members of the family, or the trained nurse or nurses, should be set aside solely for the duty of caring for the invalid, and should change their clothes and bathe in a room adjoining that in which the patient lies, and thoroughly disinfect themselves before going out of these rooms. The clothes worn by the attendants should consist of materials which can be boiled and washed as soon as taken off; and these light stuffs carry the contagion far less readily than heavy clothes. All books used by the patient, or his attendants while they are on duty, should be destroyed or carefully disinfected if a suitable disinfecting plant can be obtained. The disinfection of books is, however, all but impossible unless each page and crease is opened. All bed and other clothing used by the sick person or his attendants should be washed

in different water and at a different time from that of the rest of the family, and should not be trailed through the house between the sick-room and the laundry or made into a bundle, but instead should be submerged in a bucket or tub of bichloride of mercury solution or of hot water and so carried out to the clothes-boiler, into which it should be put immediately, the water in the boiler being already at boiling-point. The lid should be put on the boiler at once.

If it is possible to prepare the room before the patient is moved into it, all heavy curtains and hangings should be removed, the carpet taken up and the floor left bare, or, if this is inadvisable, the floor may be covered by matting which can be burned after the child is well. An iron bedstead should be used by preference, as it can be well disinfected. It is hardly necessary to add that the mattress on which the child has lain should be burned, as it cannot be well disinfected by ordinary methods. The discharges of the patient should be received in perfectly clean vessels which are constructed so as to be readily scalded out and disinfected, and a colored solution of bichloride of mercury be placed in them to destroy the contagion as soon as it leaves the body, the color being added to prevent possible poisoning by swallowing the clear bichloride of mercury solution, which may be kept in a bottle or other vessel before it is put in the bed-pan.

In regard to the child itself there is every reason to believe that the anointing of its entire body with olive oil or faintly carbolized vaseline distinctly decreases the danger of infecting other persons, since it prevents the wide dissemination of the branny scales or flakes of skin, which are highly infectious; and this treatment in addition allays the burning of the surface, seems to lower the fever, and so gives the child comfort. Much discussion has arisen as to the real efficacy of this method, some claiming that it is of great benefit in every way and others denying its usefulness. The writer, however, believes that this plan of treatment is of the greatest service and strongly recommends it. After convalescence is well established the anointings of oil should be followed in a few hours by hot baths to wash off both the oil and the dead cuticle. Particular attention should be paid to the head, for the hair often prevents the proper cleansing of the scalp. The child should not mingle with the family till every particle of desquamation has ceased nor as long as there remains any acute discharge from the nose, throat, or ears.

Treatment.

The treatment of scarlet fever requires great care and considerable thought. In no other disease should the physician use his remedies with greater care. He should be a watchman all the time and a therapeutist only when a definite indication is to be met.

From the very beginning of the case, however, particular attention should be directed to the kidneys, and any tendency to diminished urinary flow should be met by the prompt administration of mild diuretic mixtures. In the author's opinion the best results are usually obtained by the use, from the very beginning of the disease, of small doses of a mixture of sweet spirit of nitre, citrate of potassium, and water every four hours. This provides a "treatment" for the child, shows the parents that the physician is not entirely depending upon Nature for aid, and at the same time keeps the kidneys freely acting. In scarlet fever it is much easier to prevent dangerous irritation of the renal epithelium than it is to cure the trouble after it has become well developed. Should the kidneys fail to secrete a fair amount of urine in twenty-four hours under this method of treatment no other directly acting diuretic will prove of much service, but if the circulation is feeble the use of half-grain doses of citrated caffeine or drop doses of tincture of digitalis or a little sugar of milk (5 to 10 grains every four hours) may be resorted to. The caffeine, however, finds its chief usefulness after, rather than during, the acute stage of the malady, and digitalis must always be given in small doses and cautiously to children. By far the better means of relieving kidney congestion and irritation at such or other times is by the use of the hot pack so well described by Baruch in Vol. I. of this System. By this pack, if it is used cautiously and rationally, the eruption upon the skin is increased, which is always an advantage, particularly if it already be scanty; the blood is brought to the surface of the body, away from the congested areas, and the effete materials usually gotten rid of by way of the kidneys are to some extent eliminated by the skin.

If the child's temperature is not high we may employ in place of the hot pack a hot-air bath prepared by allowing the hot air from an alcohol lamp to pass under the somewhat elevated bed-clothes of the patient. If the fever is already high the cold sheet followed by the wrapping in the blanket as already referred to is preferable, as it is more soothing to the parched skin and tends to reduce the temperature.

A free allowance of pure water of moderate temperature should always be allowed the patient, and unless the amount taken is so large as to overload the stomach and disturb the appetite it can do no harm, but much good, by freely flushing the kidneys. Nothing can be more cruel or irrational than the old custom of forbidding the free use of water in scarlet fever.

Renal Disorders.—From the very first in all cases of scarlet fever two therapeutic measures, of general utility and designed especially for the purpose of protecting the kidneys from harm, must be resorted to; namely, that the patient be confined to his bed and in a

room having an even temperature day and night, whether the attack be grave or mild, and that as far as possible a milk diet be insisted upon. In these matters too great caution cannot be exercised, first because the renal complications are perhaps the most serious that we meet with, and second because they are often the result of exposure. Again, no more grievous error can be perpetrated than to regard an apparently mild case of scarlet fever as being mild enough to be treated carelessly, for often the full force of the disease seems to be expended on the kidneys, even during very mild attacks.

Again, the fact that there is present merely a febrile albuminuria does not give the physician any right to think that the kidneys are safe from attack; on the other hand, some of the worst cases of scarlatinal nephritis follow attacks in which the albumin has been almost entirely absent from the urine. Should the urine be very concentrated and pain and tenderness be felt over the kidneys mild counter-irritation by a feeble mustard plaster or turpentine stupe may be advisible.

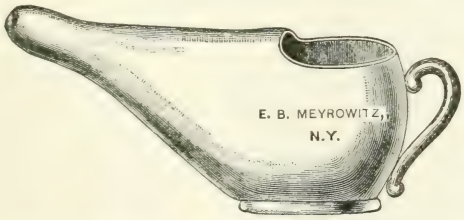
As renal complications are much more frequently causes of alarm to the physician as sequelæ than as initial manifestations of the action of the scarlatinal poison, they will be still further considered later on in this article.

Sore Throat.—One of the earliest and most annoying symptoms which the physician is called upon to treat is the pharyngeal inflammation which is often one of the very earliest manifestations of the disease. At first the condition may be that of the ordinary severe inflammatory sore throat, later if the case is severe or the treatment of the throat is neglected there may be ulceration and the development of a false membrane, and this in turn may be diphtheritic or non-diphtheritic. If the sore throat is severe we frequently have developed much swelling and induration of the tissues under the jaw and in the neck, and the cervical lymph-glands also become greatly swollen. This swollen condition is sometimes called the "collar of brawn." This collar of brawn and its accompanying sore throat is best treated by placing about the patient's throat cloths wrung out in ice-water with sufficient frequency to keep them very cold. Much better than the cloths, however, is the use of an ice-collar formed of a sausage-shaped bag filled with ice. Suppuration in such cases is rare and poultices are never to be employed unless pus is evidently already forming. Should pus form it should be evacuated at once by the knife under the most strict antiseptic precautions. The throat itself should be treated antiseptically and kept constantly cleansed either by the patient using a gargle, or, if he be too young to use a gargle, a spray of Dobell's solution followed by some mild antiseptic such as diluted peroxide of hydrogen or carbolized water (1 : 100).

Often the holding of a small piece of ice in the mouth will relieve the pain of the sore throat, but the difficulty with this treatment is that in the end it increases thirst, and the water from the melting ice may disturb the stomach. Should the condition of the throat become membranous the exudate and the surrounding areas must be treated as if it were the manifestation of acute diphtheria, and for these methods the reader is referred to Dr. Park's article in this volume, or to Dr. Chalmers Cameron's article in Vol. II. of the earlier issue of this SYSTEM.

If the nasal passages are not perfectly free and clean the physician should make them so, for nasal complications in scarlet fever are always serious, and from the nose the middle ear is very apt to become infected by way of the Eustachian tube. If the atomizer cannot be used owing to the struggles of the child the Ideal Nasal Douche of Meyrowitz should be employed. This consists of a glass pitcher of small size and peculiar shape as is shown in the accompanying cut (Fig. 6). The nurse places the child

FIG. 6.



astride of her lap with its back toward the physician, and thus, the physician having covered his knees with a towel or rubber sheet, the head of the child is placed on his lap with its buttocks, back, and limbs resting on the lap of the nurse. By allowing the head of the patient to slip a little between the knees the physician can fix it, and the nurse has good control of the body and limbs, the knees being controlled by the elbows while the hands are held by the nurse's hands. The physician can then use the nasal douche with ease, but a syringe ought never to be employed, since by its use the Eustachian tube may be dilated and infected. After the nares have been well cleansed by this process a gentle spray or vapor of menthol, eucalyptol, and albolene may be driven gently into the nose to soothe the nasal mucous membrane. This formula may be ordered as follows:

℞. Menthol,	gr. iij (0.15);
Eucalyptol,	gr. v–x (0.3–0.65);
Albolene (liquid),	f℥j (30.0).—M.

Or in some cases oil of cinnamon in the proportion of 1 drop may be added to this mixture with advantage.

The difficulty of using any form of nasal treatment in unruly or easily frightened children is great, and in those instances in which the attempt repeatedly produces great struggles and strangling it should not be insisted on unless the presence of false membrane or purulent matter makes the local treatment absolutely necessary, for the exhaustion of the patient does more harm than the local treatment does good.

Fever.—Naturally one of the most constant and often pressing symptoms in scarlatina is the fever, and the question arises as to how much it should be combated by medicinal or other means. This question can be answered in regard to medicines very readily by a negative. The fever of scarlatina ought not to be controlled by drugs, for all the antipyretic drugs have to be eliminated by the already overstrained kidneys, and all of them probably reduce the vital resistance of the system of the patient to the disease. If any antipyretic measures are to be used they must be by means of the use of cold or tepid water in the bath, by sponging, or by the wet sheet. No necessity exists for controlling the fever provided it does not exceed 103° with constancy. If, however, it is in excess of this amount for any number of hours prompt antipyretic measures are advisable. The rule to be followed is that we should use the hydriatric measure which accomplishes our purpose with the least discomfort or shock to the patient. In other words, we order the patient to be sponged off back and front with tepid water, to which may be added a little alcohol for its cooling effect and because it will allay to some extent the fear of the friends that the patient will catch cold. At the time that this sponging is performed the skin should be gently rubbed to keep the blood to the surface. If the use of water at 90° F. fails to reduce the temperature, then we can use it at 85° or even as low as 70°, and if continued sponging for a half-hour fails to materially lower the temperature, then we may resort to the graduated cold bath, or more correctly the graduated tepid bath. The patient is gently laid in a tub containing about 15 inches of water, the temperature of which may be 95° or 90° F. While in the bath he is gently rubbed, and every few moments some of the hot water is removed and in its place is poured in some a little lower in temperature. By this means, if it is done gently and without splash and confusion, the temperature of the bath is gradually lowered, without the production of fright or shock to the patient, and the child's temperature is gradually reduced. Care should be taken that the face and head are bathed with a cooler water than that used in the bath, for if the head is not wet and the body is immersed cerebral congestion naturally results. While certain

practitioners have recommended the pouring of cold water over the patient this process always causes so much shock and fright as to seem to the writer inadvisable and unnecessary. If the fever amounts to hyperpyrexia and becomes a factor of great danger, even the ice-bath may become necessary. The greater the use of cold the more necessary is it to use friction all the time that the patient is in the bath. After the bath the use of a little brandy or whiskey in milk or water may be advisable to bring the blood to the surface if the patient seems cold.

An advantage of the bath aside from the reduction of the fever is the allaying of the itching and burning of the skin and the production of restful sleep or nervous quiet in place of jactitations.

Nervousness and Delirium.—The control of these symptoms is largely obtained by the proper use of the cold baths just described, but in addition we have two other methods of control not yet named, viz. the use of an ice-bag to the head or nape of the neck and the administration of certain nervous sedatives. In the application of the ice-bag the object sought is the gentle abstraction of heat, and for this reason it should be wrapped in a piece of flannel to prevent condensation of moisture on its surface and to prevent local aching from too close applications of cold. The use of the ice-bag is greatly to be preferred to the use of sedative drugs. If it fails, however, then we turn to small doses of the bromides and of chloral with some degree of confidence. The following prescription may be used:

℞. Chloralis, gr. xxiv (1.60);
Sodii bromidi, ʒj (4.0);
Syr. lactucarii (Aubergier), fʒij (60.0);
Aquæ, q. s. ad fʒiij (90.0).—M.
Sig. Dessertspoonful (8.0) every five hours in water if needed (for a child).

In other cases where the only need of such sedatives is at night to produce sleep, a larger dose of bromide of sodium may be used; up to 20 grains if needed by a child of 8 or 10 years.

The itching of the skin and its intense burning, when not relieved by the use of bathing, is best treated by gently anointing the entire body with olive oil or vaseline, either of which may be slightly carbolized (1:100) for the anæsthetic and antiseptic effect of the acid. Curiously enough, such an anointing usually lowers the fever by reducing the peripheral irritation.

Complications and Sequelæ.—We now come to a consideration of the complications and sequelæ of scarlet fever. Their importance is very great, and it is not uncommon, as we have said before, for

a patient to have a mild attack of scarlet fever and a severe attack of nephritis afterward. The worst complications or sequelæ are nephritis and otitis media, which in turn may end in chronic kidney trouble which ultimately destroys life, or in deafness or even in serious and perhaps fatal mastoid disease. Of the prevention of the renal disorder we have already had something to say, so that only its actual treatment when once established remains to be considered. From the beginning of the illness to the end of convalescence a daily measurement of the urine should be made and recorded; and not only should the urine be tested for albumin, but it should be examined microscopically every few days. If it contains only a few narrow hyaline casts, little worry about renal disease need be felt; but if free blood corpuscles and a large number of epithelial casts are present, then the indications of marked renal trouble are present. If in addition the patient has much headache, drowsiness, or vomiting, still further evidences of renal involvement are unfortunately at hand. The bowels should at once be moved by a saline purge, such as magnesium sulphate, preceded, if the case permits, by a dose of calomel, and the free action of the skin may be aided by a hot bath and a hot drink after it. Should the uræmia produce a convulsion the prognosis is of course grave, and the hot bath is our best means of relief. In the bath may be placed a little mustard to increase its stimulating effect on the skin. For the treatment of the nephritis when it has become a well-defined lesion the reader is referred to the article on that subject by N. S. Davis, Jr., in this volume, or that by Dr. Smith in Vol. II.

For very many weeks after an attack of scarlet fever the patient will remain with easily irritated kidneys, and it is well for the physician to keep an eye on his patient for some months, and to examine the urine from time to time, particularly as cold weather approaches. If cold weather produces albuminuria, the patient should be sent to some warm and mild climate where an out-door life without exposure can be followed.

Otitis.—This complication of scarlet fever is often ignored unless its severity enforces attention. If the patient is suffering from delirium and is semi-comatose at the time the otitis is developing, the first intimation the physician may have of the difficulty may be the sudden appearance of a free discharge from the ear. If, however, the pain calls attention to the lesion early in its development, then the physician should resort to the methods described by Dr. S. MacCuen Smith in his article on the Ear in this volume.

Anti-streptococcic Serum.—It is a well-known fact that some of the serious symptoms of scarlet fever arise not solely from the particular micro-organism of the disease, but also from the toxæmia induced by the streptococci found present in large numbers in this affection.

Acting on this fact Marmorek has employed the anti-streptococcic serum, prepared by him, in 96 cases of scarlet fever. Of these 4 died from diphtheria and 1 from pneumonia. In every case the swollen cervical glands and the albuminuria were decreased and no serious symptoms were caused by the injections. In 57 cases of this disease Baginsky has resorted to a similar plan of treatment with great success. Of the 57 cases only 48 were suitable for analysis, and the death-rate in these was 14.6 per cent., the usual mortality in previous years being 22.6 to 34.4 per cent. Further, among 238 cases not treated by the serum the death-rate was 24.9 per cent. The cases which received the serum were less severe than those which had not its beneficent influence.

MEASLES.

The necessity for treatment of measles is usually in direct proportion to the bad handling of the case from a hygienic point of view, unless the attack be uncommonly severe or the patient be already weak and feeble and so unable to resist disease. In a certain proportion of cases the complications of measles prove dangerous, but in the ordinary attack as we meet with it the symptoms only need guidance to prevent their becoming very severe. The worst cases we are called upon to treat are those which have been exposed to cold during the early or later stages of the malady and as a result have acquired a secondary bronchitis or catarrhal pneumonia.

The treatment of measles itself therefore consists in putting the patient to bed, as a precaution against his exposure to draughts, and in a darkened room in order to avoid any irritation of the eyes by light. The patient being thus protected, his diet should be of the simplest, devoid of sweets and consisting largely of milk, and he should be allowed to drink pure water freely. If any concentration of the urine or scantiness of its secretion ensues, a mixture of sweet spirit of nitre and citrate of potassium with water may be given. If the conjunctivitis becomes excessive or other ocular symptoms develop, the treatment suggested by Dr. Casey A. Wood in this volume may be instituted, while for any bronchial or pulmonary complaint the methods advised in Dr. Herrick's article are advisable.

DISEASES OF THE NASAL CHAMBERS AND ASSOCIATED AFFECTIONS.

By E. FLETCHER INGALS, M. D.

INFLUENZA.[1]

Influenza, also known as grippe and epidemic catarrh, is a catarrhal fever characterized by intense inflammatory symptoms referred to the mucous membrane of the air-passages or digestive tract and great prostration of the nervous system. The disease attacks alike young and old, male and female, of whatever walk in life, excepting infants, who seem to enjoy immunity from it.

Our knowledge of the pathology of the disease does not furnish us with very exact ideas as to its proper treatment. In fact, no lesions peculiar to the disease are found, in the fatal cases death resulting from some complication. The mucous membrane of the alimentary and respiratory tracts usually furnish signs of inflammation, as do also not infrequently the serous coverings of the brain or those of the abdominal or thoracic cavities. Usually at the autopsy the lungs present well-marked evidence of lobular consolidation. From our knowledge of the disease it is evidently dependent upon some transmissible cause, either irritating gas or specific micro-organism.

Its course is marked by three stages: First, the stage of invasion; secondly, the catarrhal stage; and thirdly, the stage of decline and convalescence. The period of invasion is of exceedingly variable duration. Sometimes for twenty-four or forty-eight hours preceding the onset a feeling of general malaise is experienced, this being followed by a chill of greater or less intensity, but the disease may come on suddenly without prodromal symptoms, with distinct rigors or chilly sensations, these alternating with flashes of heat. Headache, pain in the back and limbs, tightness of the chest, and muscular prostration are early symptoms, and are not unlike those of the inception of many acute diseases. The characteristic feature of the period of invasion is intense prostration, out of all proportion with the severity of the other symptoms. Sometimes the symptoms of the first

[1] A consideration of this disease from the standpoint of the general practitioner will be found on p. 143.

stage are absent, and they seldom last more than a single day. The first stage is usually followed by the ordinary symptoms of acute coryza, with sore throat, frequent hacking cough and often dyspnœa, even without apparent involvement of the lung tissue. Paroxysmal sneezing, earache from inflammation of the Eustachian tubes and middle ear, and sometimes epistaxis are observed. Intense frontal headache and sensations of tension and fulness about the vertex, neuralgic pains, and soreness of the muscles are common symptoms.

The nervous system becomes profoundly affected, and in this fact lies one of the principal marks of difference between influenza and ordinary catarrhal fevers. There is a feeling of præcordial distress, muscular tremor, disturbance of the special senses, vertigo, tinnitus aurium, and insomnia. The cutaneous sensibility may be exalted. There may be mild delirium and great despondency. The fever rises rapidly and varies between 100° and 102° F., occasionally reaching 104° and 105°, being very irregular in its course but usually remittent in character. Again, it may be absent or subnormal. The pulse commonly ranges from 90 to 100, and may be much higher.

The inflammation may extend to or below the larynx, involving the trachea and bronchi. Laryngeal irritation causes paroxysms of dry coughing. The tracheitis and bronchitis produce their usual symptoms and add to the discomfort of the patient. The nasal secretion, at first thin and watery, later becomes muco-purulent. The mouth is pasty, the tongue being covered with a thick fur. Food tastes bad, there is excessive thirst, and loss of appetite. Abdominal tenderness followed by diarrhœa, nausea, and vomiting may be observed.

In many cases the course of the disease is marked by the predominance of symptoms pointing to the involvement of special organs. Thus there may be an encephalic form characterized by exaggeration of the nervous phenomena, as intense headache, neuralgia, delirium, and convulsions. Or the disease may be of thoracic form, the severe symptoms being referred to the lungs. Again, it may be abdominal in form, gastro-intestinal inflammation playing the important rôle.

The period of decline and convalescence is exceedingly variable. The disease may subside in two or three days, or may continue as many weeks or longer. As a rule, the older the patient the longer the duration of the disease. The later stages of the disease are usually marked by gradual subsidence of the symptoms, but sometimes the affection terminates abruptly with some critical discharge. Convalescence is usually slow and is frequently attended by persistent cough, loss of appetite, and excessive fatigue after slight exertion. Relapses are very frequent.

Before instituting treatment for the disease it is to be distinguished

from acute, non-specific rhinitis and inflammation of the larynx, trachea, and bronchi, also pharyngitis and tonsillitis. Influenza is not altogether unlike these diseases, but differs greatly in its epidemic nature and in the severity of its symptoms. During epidemics of this disease there is a popular inclination, which unfortunately extends even to physicians, to invest every catarrhal disorder with the name of the current epidemic. In this way acute pharyngitis, or tonsillitis, and even acute catarrhal gastro-enteritis, typhoid fever, and tuberculosis are mistaken for influenza proper. But usually the proper diagnosis can be made by the history of an epidemic, the generalization of the symptoms throughout the mucous membranes of the body, the severe headache, mental depression, and muscular pains. The physician is usually called upon in the course of the case to give an accurate prognosis, and, without proper diagnosis and definite ideas as to the involvement of the different organs, and complications, he is often led to make a grave mistake.

When occurring in the very young or the aged, or in persons greatly debilitated from any cause, or in persons suffering from chronic cardiac, renal, or pulmonary disease, influenza must be regarded as a grave affection. Uncomplicated cases seldom prove serious, but with the complications referred to probably about 3 or 4 per cent. prove fatal. When pregnancy complicates, abortion is likely to follow. The common sequels are rheumatism, functional heart-disease, protracted fevers of a typhoid character, pleurisy, and pulmonary tuberculosis.

Treatment.—We are as yet unable to prevent the disease by any form of treatment, but during an epidemic everyone should be especially careful to avoid exposure; and the enfeebled as well as children should remain in-doors as much as possible. The administration of quinine and nux vomica may have some effect in rendering the system less susceptible to an attack. At the onset of the disease the patient should be put to bed. A laxative dose of castor oil or a seidlitz powder should be administered. Quinine and opium are said to abort the attack. In the course of the disease agreeable drinks and light diet are to be allowed. Bronchial catarrh and cough can be relieved by the usual remedies. Phenacetin and other coal-tar products may be given to relieve the pain, but should not be long continued. The salicylates are probably better for this purpose, and when administered early may shorten the attack. Later, preparations of nux vomica, hyoscyamus, and camphor, together with potassium bromide, in large doses, which has a marked effect on the cough, are recommended. Hot moist inhalations relieve the irritability and inflammation of the mucous membrane of the upper air-passages; oleaginous or weak alkaline sprays relieve the nasal mucous membranes. Complicating

diseases are to be looked for and treated as they appear. During convalescence quinine, iron, strychnine, elixir of calisaya bark, compound tincture of cinchona, and other vegetable bitters are very useful, and are needed for a considerable period of time. If the convalescence is protracted a change of climate may accomplish great good. The patient must avoid exposure to cold until the health is restored.

RHINITIS.

Simple Acute Rhinitis.

Simple acute rhinitis, also known as acute coryza, acute nasal catarrh, acute cold in the head, and acute rhinorrhœa, is an inflammation of the nasal mucous membrane. It is characterized by sneezing, hypersecretion, and more or less obstruction of the nares. It occurs among all classes of society, at all ages, and in all seasons and climates.

Fermi and Bretschneider[1] after careful clinical and bacteriological researches upon cases of acute rhinitis claim, first, that simple coryza is not a germ disease; second, that many coryzas are due to the irritant action upon the nasal mucosa of exciting agents, partly physical and mechanical and partly chemical, attacking the mucosa from the external surface, as trauma, polypi, fumes, etc., or from within, as after the ingestion of iodides; third, that colds so called are due to functional trophic, vasomotor disturbances of the mucosa. They are not due to the action of mere cold as such, but to sudden and severe changes of temperature combined with a high hygromic state or when the body is overheated. According to Fränkel infantile coryza is generally due to direct infection from the vaginal secretions at the time of birth. Other causes are, inhalation of certain gases, hot air and dust; exposure to the rays of the sun, eczema, measles and other fevers, and extension of inflammation from the pharynx, larynx, or conjunctivæ. Checking of chronic discharges, as of otitis and ophthalmia, or bleeding hæmorrhoids, is said to be followed in some cases by acute coryza.

One or both nares may be involved and the inflammation may extend into the accessory sinuses, tear-ducts, and Eustachian tubes. On rhinoscopy the mucous membrane appears red, swollen, and, if early in the disease, dry. In a very short time a profuse serous secretion appears, which later becomes sero-purulent. The nostrils and upper lip may be greatly irritated by the discharge.

The attack may be ushered in with more or less chilliness, headache, malaise, aching of the back and limbs, and slight fever. Sneezing, partial nasal obstruction, and hypersecretion follow. General symptoms may be severe or slight. There is usually mental and

[1] *Archiv. Ital. de Otol.*, 1895, iv.

physical debility and sleeplessness, partially from mouth-breathing and partially from pains and headache. The senses of taste and smell may be obtunded. From extension of the inflammation to the Eustachian tubes there is often earache, a sense of fulness or ringing in the ears, and partial deafness, all of these symptoms being generally relieved by the application of a small amount of a weak solution of cocaine, which reduces the swelling. Exceptionally the cervical lymphatics become enlarged and tender. The voice usually lacks the nasal resonance and articulation is imperfect, the letter *m* being sounded like *b* and *n* like *d*.

The attacks sometimes last but a few hours, but usually last from a few days to a week or two, and are sometimes prolonged several weeks. Repeated attacks usually bring on the chronic form of rhinitis or chronic inflammation of some one or more of the adjacent sinuses or cavities.

Treatment.—It is quite as important to treat patients between attacks as during the inflammatory process. In this way much can be done to prevent subsequent recurrence of the affection. For this purpose daily exercise in the open air, sponge baths over the chest, with cold water or salt and water, cold foot-baths, proper clothing, and avoidance of exposure to all things which have been found to excite the inflammation of the mucous membranes, are to be advised. Early in the disease a hot foot-bath, together with a bowl of hot lemonade before going to bed and 10 gr. of Dover's powder given at the same time, will usually check the pain, produce sweating, and often abort the attack. Quinine in large doses, alcoholic stimulants, and the ammonium salts also have a reputation for aborting the attack.

A brisk cathartic early in the attack, especially when the bowels are confined, is of great service. Sometimes the affection may be aborted by frequent inhalations of chloroform, or of chloroform with 5 to 10 per cent. of menthol, poured out into the palm of the hand; or the vapor of ammonium carbonate, camphor, iodine, or carbolic acid. But perhaps the most satisfactory abortive treatment is large doses of quinine supplemented by the application to the nares of a small amount of cocaine, either in powder or by spray.

A cold twenty-four hours old can seldom be aborted. It will run its course and must simply be carried through to a speedy favorable termination, giving the patient as much relief as possible.

Totally abstaining from liquids, as recommended by C. J. Williams,[1] is said to cure the attacks, the nasal secretion beginning to dry up in about twelve hours, and ceasing in from twenty-four to thirty-six hours. He allowed but a half-ounce of milk or tea twice a day and an ounce of water at night.

[1] *Cyclopœdia of Practical Medicine*, London, 1883.

If Turkish baths are taken, as they sometimes are with benefit, great care should be taken to avoid subsequent cold.

I have obtained the most satisfactory results by administering at first some form of opium or morphine with a large dose of quinine, this to be followed by the application to the nasal mucous membrane of 1 to 2 per cent. of cocaine in water, oil, or in a powder with sugar of milk and starch. The use of an oily spray four or five times a day protects the surfaces and greatly aids in the treatment. The patient may take three or four times a day small doses of nux vomica, together with camphor monobromated, and cinchonidia salicylate or quinine.

Chronic Rhinitis.

Chronic rhinitis, also called chronic catarrh and chronic coryza, is characterized by dryness of the nasal mucous membrane, excessive secretion from the nostrils, which may either discharge freely or partly collect in crusts. The nares are usually partially obstructed and there is an inclination to clear the throat by hawking and expectorating. The disease is brought about by frequent exposures to the causes of the acute form and occurs in all climates in every season, being less pronounced in summer. Residents near large bodies of water and also those in dry, dusty climates seem to be attacked most frequently, so we cannot well depend on climate alone in the treatment of the disease; but people engaged in out-door work become less susceptible to it.

In order to properly treat any case we must place it in its proper class. We find several varieties of chronic rhinitis. They have been classified as follows: 1. Simple Chronic Rhinitis; 2. Intumescent Rhinitis; 3. Hypertrophic Rhinitis; 4. Atrophic Rhinitis.

Simple Chronic Rhinitis.

Simple chronic rhinitis is a catarrhal inflammation of the nasal mucosa attended by little or no swelling.

The patient usually gives a history of repeated attacks of "cold in the head," and states that for some time past, several months or more, he has suffered with a constant irritation in the nares. These irritations are described as itching, burning, or tickling in character. Sneezing occurs with slight provocation. The eyes often ache, and pain in the frontal region is very common. The senses of taste and smell become less acute and hearing is imperfect. The inflammation may extend through the tear-duct to the conjunctiva and severe lachrymation result. There is usually a profuse watery discharge from the nose occurring upon trifling irritation such as the inhalation of cold air. Later the discharge may become muco-purulent. The

general health of the patient is not usually much impaired by this affection.

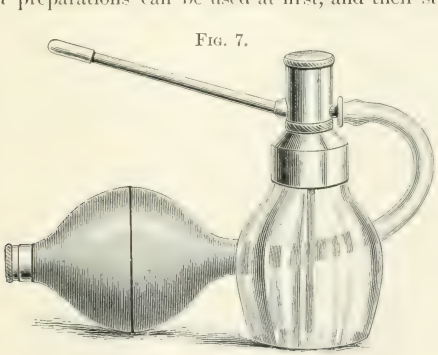
On rhinoscopic examination the mucous membrane is found to be congested, the surface bathed in its own secretion, with more or less mucus collected in the nasal cavity, and at times there may be tenacious masses of partially dried secretion clinging to the walls. The naso-pharynx presents a similar condition of congestion with adhering secretions.

Before deciding upon the treatment the diagnosis between this affection and hay fever must be made. It will be remembered that the latter comes on at stated periods of the year, while rhinitis may appear at any time and is apt to be continuous with occasional exacerbations. Though the use of the probe may detect special sensitive spots, as in hay fever, the atrophic and hypertrophic changes so characteristic in chronic rhinitis are not so apparent in hay fever.

Treatment.—In spite of treatment the disease may be tedious in its course and terminate in some of the other forms of rhinitis. A cure may be sometimes established and much relief is afforded by proper treatment. The irritability of the mucosa can be relieved and the excessive secretion checked, so that even if a permanent cure is not ensured the treatment is very satisfactory.

Watery secretion serves one useful purpose—that of cleansing the nares, so that when this is present washes are unnecessary. In this class of cases soothing astringent powders and sprays are very efficacious. These applications should after a few seconds of discomfort cause a feeling of relief. They should never irritate for more than five minutes. Mild preparations can be used at first, and their strength may

FIG. 7.



Davidson's Oil Atomizer, No. 50.

be gradually increased as the membrane becomes toughened. Some physicians adhere to alkaline solutions, but the oily sprays are doubt-

less of greater utility. Liquid albolene and oleum petrolina are most commonly employed. Melted vaseline has also been put to the same use. The effect of these oils is soothing and palliative. They should be prescribed for the patient to use freely at home two or more times a day. The addition of ten minims of terebene to the ounce of one of the above oils is sometimes effective in checking the discharge. These sprays are best applied by some atomizer that throws a large spray, like the No. 50 Davidson (Fig. 7).

Below is a prescription for a sedative powder which may in some cases be applied once or twice a day, in addition to the spray, with decided benefit:

R. Iodol, gr. v (0.3);
Amyli, gr. ij (0.12);
Sacchari lactis, q. s. ad gr. c (6.65);
[With or without—
Cocainæ hydrochloratis, gr. i–ij (0.05–0.12)].—M.

The prescription must not, however, be given the patient so that it could be repeated, and it must not be employed continuously.

The sensitive areas can be best relieved by superficial cauterizations with the galvano-cautery, as in hay fever. These operations can be performed as often as once in five or seven days. Sedative powders and sprays should be used between treatments. The terminal fibres of the hypersensitive nerves are thus destroyed, but no scar is left because the mucous membrane is not burned deeply enough.

Intumescent Rhinitis.

Intumescent rhinitis is a form of chronic rhinitis occurring more frequently than any of the other varieties. Its chief feature is the intermittent swelling of the nasal mucosa, causing more or less obstruction to nasal respiration. The swelling may be found on both sides, but usually but one side is obstructed at a time, though this condition may change in a few moments to the opposite naris. Often, when the patient is lying on the side, the undermost cavity is occluded, but, a few moments after turning over, the opposite side stuffs up and the side formerly obstructed becomes free. Inspection will usually detect congestion of the mucous membrane, but it may appear pale. Usually the swelling or tumefaction is confined to the mucous membrane covering the inferior turbinals, but the middle turbinated bodies may also be involved, and even part of the membrane over the septum, especially that part directly opposite the turbinated bodies. It is not unusual to find the cavities temporarily free, though obstruction in one or both nares may have been noticed several times during the

day or night. On the obstructed side more secretion is usually found, because of imperfect evaporation and increased activity of the glands. The pharynx and even the larynx may finally become chronically inflamed, and, if the inflammation extends to the Eustachian tubes, partial deafness results, all of which complications are often relieved by reduction of the nasal swelling.

In this as in other forms of chronic rhinitis we have to assign repeated exposure and acute attacks of rhinitis as the cause. The patient gives a history of great susceptibility to the disease. He complains of the annoyance of mouth-breathing from nasal obstruction, attended by hawking and efforts to clear the throat, particularly in the morning and after eating, and also of dropping of mucus into the throat from the naso-pharynx. There may be little or no increase of nasal discharge. The secretion sometimes collects in the nares, and if it remains for any length of time becomes offensive from decomposition.

Intumescent rhinitis must not be confounded with the hypertrophic form, from which it can be distinguished in uncomplicated cases by the use of a 4 per cent. cocaine powder or spray thrown into the nares. This in two or three minutes reduces the swelling so that the cavities appear of normal size. So also exercise, as running up-stairs, may produce temporary reduction of the swelling. In the intumescent rhinitis the soft tissues may be pressed down with the probe until the bone is felt, the dent thus formed quickly disappearing on removal of the instrument. Nasal mucous polypi are lighter in color; they can be moved; they allow the passage of the probe on either side, and are not reduced in size by the application of cocaine.

Before considering the treatment it must be remembered that intumescent rhinitis, if left to itself, may terminate spontaneously in recovery, but that it usually lasts for months or years and at last eventuates in the hypertrophic form; also that pharyngitis and laryngitis often result from mouth-breathing, and that in many cases throat-deafness is caused by involvement of the Eustachian tubes. The effect of imperfect oxygenation of the blood upon the general health is not to be forgotten, such patients having much less endurance than those with free nasal chambers.

Treatment.—Great importance is attached to the prophylactic treatment of the disease. All persons susceptible to catarrhal troubles should be very careful to avoid exposure to all causes known to produce the affection. They should wear woollen underclothing all the year round, the hot summer months alone being excepted, when silk but not cotton underwear may be substituted. Systematic exercising regularly practised, followed by cold sponging and the vigorous use

of a coarse towel, together with daily bathing the feet in cold water, will be found of great service in preventing colds.

In the early stages of the affection sedative remedies regularly used, together with mild astringents or stimulants occasionally applied to the nose, may establish a rapid cure. The milder stimulating remedies, which may be applied two or three times per week, consist of solutions of zinc sulphate about gr. ij to the ounce, with or without a similar amount of carbolic acid or zinc chloride, gr. ij to gr. v to the ounce of distilled water. Milder solutions should be employed at home two or three times each day, such as boric acid gr. x to the ounce, or sodium bicarbonate and biborate, equal parts, gr. iss to gr. ij to the ounce. When a somewhat more stimulating application is desired a saturated solution of boric acid in camphor-water is excellent. Oily preparations containing camphor gr. $\frac{1}{2}$ to j, menthol gr. ss to j, or thymol gr. $\frac{1}{4}$ to $\frac{1}{3}$, are generally of more benefit than the aqueous solutions. The sedative powders mentioned under Simple Chronic Rhinitis may also be very advantageously employed in addition to this treatment.

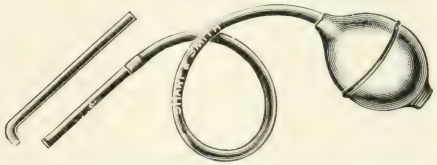
The continuous use of cocaine in however small quantities should be avoided, both on account of the danger of forming the cocaine-habit and because it seems to partially paralyze the vasomotor nerves when used for any length of time and thereby causes turgescence of the cavernous tissue of the mucous membrane and thus aggravates the affection we are endeavoring to relieve. When properly employed, however, this drug is of great advantage in relieving the acute exacerbations of the disease and causing the temporary reduction of the swelling. Cocaine is very conveniently used in powder form. This may be blown into the nares by means of a hand-insufflator, two or three times a day, in doses not to exceed gr. $\frac{1}{30}$. The following formula is recommended:

℞. Sodii bicarbonatis,
Sodii biboratis, *āā.* gr. iss (0.09);
Amyli, gr. j (0.06);
Cocainæ hydrochloratis, gr. iv (0.25);
Sacch. lact., q. s. ad gr. c (6.65).—M.

This is not to be prescribed, because of the danger that the prescription may be refilled. It is much safer to dispense the powder to the patient so as to be able to know just how much he is using. He may also be supplied with a short glass tube about four millimetres in its internal diameter and eight or nine centimetres in length, flattened and expanded at one end but round at the other, to be used for applying the powder. He is instructed to work a small quantity into the

round end of the tube by moving it about in the powder, and to slip one end of a piece of rubber tubing about twenty-five centimetres in length over the same end of the glass tube; then place the flattened end in the nostril and the free end of the rubber tube between his lips and with a short quick puff blow the powder into the nares. When the physician makes the applications it is much more elegant to use a hand-insufflator (Fig. 8). Any application for frequent use

Fig. 8.



Powder-Blower (one-third size). Two glass tubes—straight tube for nasal, bent tube for naso-pharyngeal, applications.

at home should not cause discomfort for more than three or four minutes, and should be followed by relief to the patient. Stronger applications may be made every two to five days.

Secretions that collect in large quantities in the nasal chambers should be washed away once or twice a day with an alkaline or salicylate solution, as the following:

℞. Sodii salicylatis,
Sodii biboratis, āā. ʒvj (24.0);
Sodii bicarbonatis,
Sodii chloridi, āā. ʒx (40.0).—M.

Sig. ʒj (4.0) to Oj (500.0) of tepid water.

Or, Rhodes' nasal tablets, the formula for which is—

℞. Potassii chloratis, gr. iiss (0.15);
Sodii bicarbonatis, gr. x (0.65);
Sodii chloridi, C. P., gr. x (0.65);
Sodii salicylatis, gr. v (0.35);
Sodii biboratis, gr. v (0.35);
Thymol, gr. $\frac{1}{8}$ (0.008);
Eucalyptol, ♏ $\frac{1}{4}$ (0.016).—M.

Sig. Dissolve one tablet in glass of warm water and snuff up the nose from palm of hand once or twice daily.

An excellent alkaline solution may be made at almost any home by dissolving an even teaspoonful of sodium bicarbonate in half a pint of lukewarm water, or a similar amount of equal parts of sodium bicarbonate and sodium chloride. The former sometimes causes an uncom-

fortable sensation of dryness not produced by the latter. The nose having been cleansed, the applications already recommended should be made.

These remedies give temporary relief in fully developed cases, but cannot be expected to effect a cure. They are therefore advised only as an aid to more radical treatment. The most efficient treatment consists in the cauterization of the swollen tissue, either by chemical agents or by the galvano-cautery; or in the removal of redundant tissue with the steel-wire snare or scissors.

Various chemical agents have been recommended for this purpose, but strong acetic acid or chromic acid are the most useful, the latter being usually preferred. A 50 to 75 per cent. solution of the chromic acid may be used, but a better method is to place a few crystals of

FIG. 9.

Flat Nasal Probe ($\frac{2}{3}$ size); made of aluminum, and bent at an angle of 35°.

the acid upon an aluminum probe and hold it over an alcohol or other flame so that the crystals fuse slowly and finally dry, but without burning; and then rub the fused crystals, held on the probe, over the part to be cauterized, which soon becomes of a brownish color. Any excess of acid can be neutralized by an alkaline spray, which should always be applied immediately after the use of the acid. One should never use at one time an amount of acid exceeding one-quarter the size of a grain of wheat. It should be applied along a narrow line from ten to twenty millimetres in length.

Bosworth considers touching the membrane at separate points quite as efficient, but I have not been as much pleased with this method as with the one described. A repetition of the cauterization is not advisable until complete healing has occurred, which will require from ten to twenty days. Much more pain is produced by chromic acid than by the galvano-cautery. The wound heals more slowly and gives rise to a more irritating discharge, therefore I much prefer the latter. With the galvano-cautery an electrode is used with a blade about fifteen millimetres in length made of No. 21 platinum wire. A linear incision the whole length of the turbinated body and deep enough to just touch the bone in a few places should be made. If necessary a second and even a third incision should be made a few lines above or below the preceding one, sufficient interval being left between cauterizations to allow healing to take place. Both nares may be treated in the same way if similarly affected, the cauterizations being made in turn on alternate sides.

Whatever method is used for cauterization, the site of the operation should first be anæsthetized with cocaine. For this purpose a 4 per cent. solution should be applied by means of a small cotton pledget on the flat nasal probe referred to above; or by spreading a thin film of cotton saturated in the cocaine solution over the field of operation. Some operators apply the cocaine by spray, but either of the above methods is more accurate; I prefer the first mentioned, as with it there is less absorption of the drug. When applied on the probe the application must be repeated three to five or more times at intervals of one or two minutes apart. I prefer as a local anæsthetic the following solution:

℞. Atropinæ,	gr. $\frac{1}{100}$ (0.006);
Strophanthinæ,	gr. $\frac{1}{5}$ (0.012);
Olei caryophylli,	♏iij (0.18);
Acidi carbolici,	gr. x (0.65);
Cocainæ hydrochloratis,	gr. xx (1.35);
Aquæ dest.,	q. s. ad fl ℥j (30.0).—M.

Usually when the patient cannot feel the application of the probe to the part it is ready for cauterization. It is advisable then to apply an oily spray containing about five minims of oil of cloves to the ounce. This serves the triple purpose of antisepsis, lubrication, and protection. The cauterization can now be performed as above described, after which, to assist in repair, two or three grains of iodol should be blown into the side operated upon. A small pledget of cotton should then be placed in the nostril on the same side and the patient instructed to change this at will, but to wear it for a day or two while out of doors.

Suitable after-treatment following the cauterization, either by acid or galvano-cautery, must be employed. This consists of the use at home of a mild antiseptic spray, as, for example, gr. $\frac{1}{3}$ of thymol, gr. ss of carbolic acid, and ♏iij of oil of cloves to the ounce of liquid albolene, or, if this proves too stimulating so as to cause pain, its strength must be reduced. The patient may also be given a 4 per cent. cocaine powder to be used for a few days only, to keep down the swelling which usually follows the cauterization, and thus avoid adhesions. For this powder I prefer the following formula:

℞. Sodii bicarbonatis,	gr. j (0.06);
Sodii boratis,	gr. j (0.06);
Magnesii carbonatis,	gr. iij (0.18);
Cocainæ hydrochloratis,	gr. iv (0.25);
Sacch. lact.,	q. s. ad gr. c (6.65).—M.

The patient should be directed to return on about the fourth day, when the flat probe should be passed between the site of the operation and the opposite septal wall, so as to further prevent any adhesion of the two surfaces. Cauterization may be made on the opposite side ten or twelve days later.

Coexisting laryngitis and pharyngitis should receive proper treatment at the same time. About four-fifths of the annoyance caused by this disease will disappear very soon after the nasal obstruction has been removed.

In intumescent rhinitis a slight change of climate, especially from a damp to a dry climate, will often give immediate relief, though the affection usually recurs as soon as the patient returns home.

Hypertrophic Rhinitis.

Hypertrophic rhinitis is a chronic affection characterized by hyperplasia of the mucous and submucous tissues of the nares, causing permanent thickening of the turbinated bodies, especially the inferior, and sometimes of the septum, usually at its upper part. The thickened mucous membrane is usually congested, but may be abnormally pale, the former condition calling for sedative or astringent remedies, and the latter for stimulating applications. The hypertrophy is usually limited to the soft tissues, but occasionally the bones themselves are likewise hypertrophied. The condition commonly involves both sides, but it may be limited to one naris. Exostoses, enchondroses, or deflection of the nasal septum are frequently found associated with the hypertrophy. In case of deflection the inferior turbinated body upon the concave side is apt to be much more involved in the hypertrophy than its fellow, which may, indeed, be found atrophied. There is also, in most cases, swelling of the soft parts overlying the hypertrophy, so that the nasal chambers are from one-half to three-fourths closed or completely obstructed, this condition changing from time to time with the change in the amount of swelling.

Hypertrophic rhinitis, in fact, usually results from the intumescent form, being produced by the same conditions that cause the latter variety; hence the importance of relieving all catarrhal symptoms as early as possible. Patients, however, do not usually present themselves for treatment until the hypertrophic condition is well established. They then state that they are very susceptible to colds, and that for a number of months or years there has been stopping up of the nose, especially during the night, and excessive discharge from the nostrils or into the naso-pharynx, with hawking and a constant inclination to clear the throat. Mouth-breathing upon any exertion, as in rapid walking, or when riding a bicycle, or during sleep, is a common symptom. Hearing is usually impaired to some degree; in fact, hyper-

trophic rhinitis is the most common cause of deafness. Frontal or occipital headache is frequently complained of, and also a feeling of pressure over the bridge of the nose, especially when the mucous membrane of the two sides of the nasal cavity is in contact. Temporary relief may be afforded from these symptoms by analgesics and often by local oily sprays, which protect the surface, but this improvement is seldom lasting. Inspection reveals a collection of mucus or muco-pus at the lower part of the cavity, and sometimes dried secretion collected in crusts on the septum or turbinated body. The former of these conditions is best relieved by mild alkaline detergent washes, the latter by the same applications supplemented by oily sprays. The vault of the pharynx appears congested, and often lodges tenacious mucus or dried masses that upon partial decomposition cause an offensive odor.

In order to direct the treatment intelligently it is necessary to distinguish hypertrophic rhinitis from the intumescent variety, syphilitic disease of the nose, and mucous polypi.

In intumescent rhinitis an indentation is easily made with the probe, and swelling rapidly disappears on application of cocaine—signs not found in true hypertrophy.

Syphilitic disease of the nose when unattended by ulceration can only be distinguished from hypertrophic rhinitis by a careful consideration of the history, the presence of other signs, and the effect of specific treatment.

Mucous polypi are distinguished from hypertrophy of the anterior or posterior ends of the turbinated bodies by careful inspection and palpation with a probe. Polypi are more movable, and the probe can be freely passed between them and the external wall, which is not the case in hypertrophy of the turbinals. The polypus is more translucent and its surface is smoother than that of the hypertrophied tissue.

The disease, unless properly treated, may extend over a number of years. It may terminate by atrophy in less than two years, but it is usually of long duration. The usual course is a gradual increase in the hypertrophy until the nares are much obstructed; then the disease remains stationary for a variable length of time, when at last atrophy sets in and progresses until the nares are much enlarged, though obstructed by collections of mucus that become extremely offensive. Occasionally the atrophy continues until the nasal cavities become free, and then terminates spontaneously in recovery. There is no evidence that it ever terminates in tuberculosis.

Treatment.—Until within the last ten or twelve years little or nothing of benefit was done for the hypertrophic rhinitis. Many remedies for internal and topical use have been recommended to cure

the disease, but none of them are of much value, excepting when used in connection with proper surgical interference.

In order to effect a cure it is usually necessary to remove some portion of the redundant tissue. For this purpose we have several measures at our disposal. Chemical caustics, the galvano-cautery, trephines, burrs, saws, scissors, the cold-wire snare, and the galvano-cautery snare, are all in use. Bipolar electrolysis also is credited with good results.

Among the chemical agents that have been used for this purpose are nitric and sulphuric acids, London paste, solutions of mercury nitrate, glacial acetic acid, and chromic acid. All of these caustics, excepting chromic and acetic acids, have deservedly passed into disuse.

Chromic acid is very efficient, but it is open to the objection mentioned under Intumescent Rhinitis. The monochloracetic acid is particularly useful in cases where subsequent adhesions are feared. Carbolic acid, also, injected beneath the mucous membrane, appears to have been successful in some instances. W. Scheppegrell of New Orleans[1] draws the following conclusions from his experience with over one hundred cases treated by bipolar electrolyzation: That compared with other methods it is more conservative, that it effects the destruction of the tissues without destroying the mucous membrane and its glandular elements, and that it has not the disagreeable after-pain following the application of chromic acid. Being a submucous operation, the reaction following it is very slight. He has never seen a synechia formed in the nares due to the effect of electrolyzation. As the operation is not performed as rapidly and with as few sittings as by means of galvano-cauterization, it is not so practicable in cases of young children or very nervous patients. The physical conformity of some nostrils renders it difficult to properly insert the electrolytic needles, and in these cases some other method must be adopted.

The majority of cases may be successfully treated by cauterization, as already described under the Treatment of Intumescent Rhinitis. In this form of the disease more cauterization may be necessary on either side, and very often the middle turbinated is involved so as to require like treatment. In cauterizing the middle turbinals, instead of linear cauterization a small loop-like or pointed electrode may be inserted in three or four places along the lower margin of the hypertrophied tissue.

If the hypertrophied tissue is sufficiently large to render the use of the snare or scissors practicable, one of these instruments, preferably the former, should be used to remove the redundant tissue. But often after the application of the cocaine the swelling is greatly re-

[1] *La Revue Internationale de Laryngologie*, 1896.

duced, and the snare does not then take hold of the tissue. Some patients will endure the pain of the operation without the aid of the cocaine, and then the use of the snare is quite practicable.

Whatever method of operation is used, as pointed out in Ingals' *Diseases of the Chest, Throat, and Nasal Cavities*, it should be the effort of the physician *to save as much mucous membrane as would normally cover the parts*, and to form as little cicatricial tissue as possible.

The hypertrophy may be complicated by bony or cartilaginous enlargement to such an extent that removal of the redundant soft tissues alone cannot suffice to make the nares free. In such cases the bony or cartilaginous growth may be removed by knife, saw, scissors, dental burr, or nasal trephine, as directed under their respective headings.

Submucous infiltration of the sides of the vomer is common in chronic rhinitis. It causes some obstruction to nasal respiration, also increased secretion and constant dropping into the throat. Rhinoscopic examination reveals a yellowish-white or gray puffiness on one or both sides of the vomer near its posterior margin.

Treatment.—The œdematous tissue should be destroyed by cauterization, the galvano-cautery being preferred; or it may be removed by cutting forceps.

Atrophic Rhinitis.

This may be considered the fourth stage of chronic rhinitis. It is characterized by the large size of the nasal cavities and the collection of drying secretions, which give rise sometimes to an extremely offensive odor. The disease is found among all classes and in all countries, but is usually observed in children and young adults. The cause of the disease is not well understood, but in many cases it appears to be the result of previous hypertrophy. W. A. Martin of San Francisco[1] thinks that all the symptoms and histological changes point to a lesion of the trophic nerves, causing a retardation or an arrest of development.

Usually both nasal cavities, rarely but one, are widened and enlarged to two or three times their normal size. According to More of Winterthur,[2] it is coincident with hypertrophic rhinitis in about 25 per cent. of the cases. In the remainder of the cases the turbinals are often of normal size, but in many cases they are smaller than normal, and in advanced cases may have entirely disappeared.

Because of the large size of the cavities and the tenacity of the altered secretion the patient is unable to expel it. Therefore it dries and forms crusts, which undergo decomposition and may completely

[1] *Occidental Med. Times*, 1895. [2] *Archives of Otology*, New York, 1894.

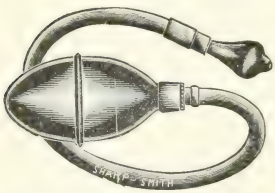
obstruct the cavities. These crusts after a few days are separated by the secretion beneath them, and may be expelled, only later to be replaced by a like mass. The odor from these collections is one of the most unpleasant symptoms of the disease, and can only be relieved by thorough washing. The mucous membrane is usually anæmic, which condition will suggest the use of stimulating applications.

The patient's general health is not usually impaired until late in the disease. The expression of the face is usually dull, perhaps on account of the broadening of the nose, thickening of the alæ, and prominence of the lips usually seen in the disease. The patient often becomes partially deaf, and the sense of smell is usually lost. The secretion is not very abundant, but tenacious and muco-purulent, and at times renders the breath extremely offensive.

The disease may be mistaken for syphilis, lupus, suppuration of the accessory sinuses, foreign bodies in the nose, each of which demands different modes of treatment. The crusts and scabs formed in lupus are usually closely adherent to the septum instead of the turbinals. When removed they leave an ulcerated, bleeding surface marked here and there by the typical tubercle. In syphilitic affections of the nose, after cleansing the part, denuded or dead bone or perforation of the septum or hard palate is apt to be found. Falling in of the bridge of the nose, which often occurs in this disease, is not present in simple atrophy. Suppuration of the accessory sinuses is usually unilateral, the nares are not enlarged, and the sense of smell is seldom lost. Rhinoliths and foreign bodies can be detected by careful inspection and palpation with the probe after the parts have been cleansed.

Atrophic rhinitis may continue for many years if left to itself, but even with the most indifferent care the majority of patients get well before reaching the age of thirty-seven. Under proper treatment a cure can be established usually in from ten to thirty months. The offensive odor can in most instances be relieved in a few days, not to reappear if perfect cleanliness is observed. The anosmia, however, resists treatment, as does also the deafness associated with the disease. At least partial regeneration of the tissues takes place in some cases.

Fig. 10.



Ingals' Nasal Syringe (one-third size).

Treatment.—*Cleanliness* is of the greatest importance in the treatment of atrophic rhinitis, and this part is to be carried out principally by the patient. He should be directed to wash the nares thoroughly from two to four times a day, using from

one to three tea-cups of fluid each time. It may suffice to snuff fluid through the nares from the palm of the hand, and this is the safest method; but if this does not clean the nares thoroughly, some form of nasal syringe (Fig. 10) or douche may be necessary; but with either of these instruments there is danger of causing deafness by forcing fluids through the Eustachian tubes into the middle ear. The syringe appears safer than the douche. While using either of these, little force should be employed; the patient should keep his mouth open and avoid swallowing. Some patients cleanse the nose with water alone, but usually it is better to use some saline solution, either sodium chloride or bicarbonate, or a mixture of the two in the proportion of a heaping teaspoonful to a pint of lukewarm water. Rhodes' tablets, four of which should be used to a pint of water, make an excellent astringent and antiseptic wash. The formula is—

R.	Potassii chloratis,	gr. iiss (0.14);
	Sodii bicarbonatis,	gr. x (0.65);
	Sodii chloridi,	gr. x (0.65);
	Sodii salicylatis,	gr. v (0.34);
	Sodii biboratis,	gr. v (0.34);
	Thymol,	gr. $\frac{1}{3}$ (0.02);
	Eucalyptol,	♏ $\frac{1}{4}$ (0.016).—M.

Listerine, phenol, or other antiseptics in small quantities may be added to the saline wash if desired. After cleansing the cavities, stimulating and antiseptic powders, preceded or followed by an oily spray, have proved beneficial in my hands. Iodol alone or combined with one-tenth to one-fifth of 1 per cent. of mercury bichloride, or boric acid 10 per cent., and cocaine 2 to 3 per cent., answers a good purpose, but the most satisfactory powder I have ever employed consists of—

Yellow oxide of mercury,	$\frac{1}{4}$	per cent.;
Iodol,	25	"
Cocaine,	2	"
Sugar of milk,	73	"

Of this one or two grains should be blown into each naris two or three times a day.

The sensitiveness of the nares will vary much in different cases, and the quantity of the mercurial will have to be increased or diminished accordingly. The powder should not cause much pain, and this should not last more than five minutes at most.

Very useful sprays are composed of liquid albolene with carbolic

acid ♏ ij and menthol gr. ss, or with thymol gr. $\frac{1}{3}$ and olei caryophylli ♏ iij to the ounce.

T. Passmore Berens[1] obtained encouraging results from the use of ichthyol in the treatment of a number of cases of fœtid atrophic rhinitis. In severe cases he applies a large cotton tampon saturated with undiluted ichthyol, inserted into each nostril and allowed to remain fifteen minutes. The patient then finds it easy to expel most of the scabs, which latter become loosened by the copious secretion produced. All sinuosities, especially the spaces between the turbinated bodies and the outer wall of the nose, are then cleansed with cotton saturated with ichthyol, using considerable force in rubbing, thus massaging the mucous membrane with pure ichthyol. In less severe cases or where the scabbing is slight the tampon is not used.

Zinc stearate, with 25 per cent. europhen as a stimulant,[2] applied with an insufflator after cleansing, has been used with some success.

Constitutional treatment with quinine, iron, strychnine, arsenous acid in some form, and iodine is of great assistance in many cases. The iodine in sufficiently large doses to cause an increase in nasal secretion frequently gives excellent results.

OZÆNA.

Ozæna is a form of atrophic rhinitis characterized by an intolerable odor of the nasal secretion. The ultimate cause of the disease has not been settled. It is supposed, however, to be of microbic origin, the germ resembling the pneumococcus of Friedländer. Capart of Brussels[3] insists that it is contagious, but this is extremely doubtful. He claims to have often had the husband consult him some years after marriage for ozæna contracted from his wife, and that often a mother suffering from ozæna communicates the affection to her children by allowing them to use her handkerchief. Heredity seems to play an important part in the causation, and there can be but little doubt that it is generally preceded by hypertrophic rhinitis. It also appears, sometimes at least, to be the outcome of a distant inherited syphilitic taint.

The mucous membrane of the nose is deficient in secreting glands and thin, tender, and often ulcerated at some point. The nasal cavities are larger than normal, and the surface is more or less covered with dry decomposing crusts which can only be removed by the most careful washing. The treatment is essentially the same as that for ordinary rhinitis, though it must be more assiduously employed.

Muschold[4] specially recommends a spray consisting of pure glyce-

[1] *American Medico-Surgical Bulletin*, July, 1895.

[2] Gibbs of Philadelphia: *Medical News*, December, 1894.

[3] *Journal de Médecine, de Chirurgie, et de Pharmacologie*, July, 1895.

[4] *Review Internat. de Médecine et de Chirurgie*, Paris, April, 1895.

rin 7 parts, sodium borate 20 parts, and water 30 parts. The glycerin prevents the formation of crusts by causing an abundant watery secretion, and the sodium borate prevents the decomposition of the exudate. The cavities are then to be cleansed by an applicator armed with cotton, and the spraying repeated so as to reach the entire nasal cavities. The patient should use the atomizer three times a day. Under these applications the odor is said to vanish in a few days.

Mackenzie of Edinburgh [1] claims to have successfully treated many cases of ozæna by curetting away the diseased membrane, which he says was replaced by healthy mucous membrane.

RHINITIS MEMBRANOSA.

Rhinitis fibrinosa is an inflammation of the nasal mucous membrane characterized by the formation of a membranous exudate, producing nasal obstruction and giving rise to the symptoms of acute rhinitis, with some constitutional depression. It is claimed by some to be *nasal diphtheria*, as the Klebs-Löffler bacillus has been found in most cases submitted to bacteriological examination. However, its course is much more protracted than that of diphtheria.

Felsenthal [2] considers that, while in the majority of cases rhinitis fibrinosa consists of a form of diphtheria, it has been shown that even in undoubted cases of true diphtheria the bacilli have not a constant virulence. Nevertheless, he insists that in the present state of our knowledge a case in which the diphtheria bacillus is found should invariably be isolated. The disease generally lasts for four or five weeks, and sometimes for several months. No case has terminated fatally. Mild detergent washes or sprays should be freely employed, and non-irritating powders containing about 25 per cent. of iodol, with from 25 to 50 per cent. of trypsin, papain, or other digestive agent mixed with sugar of milk, should be applied three or four times a day.

HAY FEVER.

Hay fever, known as hay asthma, rose cold, June cold, autumnal catarrh, rhinitis hyperæsthetica, and catarrhus æstivus, is one of the neuroses occurring periodically at particular seasons. It is characterized by irritation of the mucous membrane of the eyes, nose, and air-passages, accompanied by excessive secretion and usually by asthmatic attacks.

In America the disease prevails from about the middle of August until the latter part of September, or until early frosts. Isolated

[1] *British Medical Journal*, April, 1895.

[2] *Münchener medicinische Wochenschrift*, Jan., 1895.

cases may, however, occur at any time during the year. Quite a number of cases are observed in May, June, and July, and occasionally instances occur in midwinter. June and July are the favorite months for the disease in England. Men seem to be attacked more frequently than women. It occurs most usually between the ages of fifteen and thirty-five, but no age is exempt. It seldom attacks the laboring classes, but, on the contrary, those of education and culture, and residents of towns and cities rather than inhabitants of the open country.

The nasal mucous membrane is usually highly congested and swollen. The conjunctivæ are also involved in the inflammatory process, and often also the frontal sinus and respiratory tract.

Hay fever is due to a peculiar irritability of the nervous system, supplemented by localized abnormal sensibility either of the whole or a part of the respiratory mucous membrane. There are three important factors in the etiology of the disease: First, nervous temperament; second, abnormal sensibility of the respiratory mucous membrane; and third, certain irritating substances suspended in the atmosphere. The irritants are of great variety, some affecting certain individuals and others exciting the attack in a different class of sufferers when the other factors are present. Our therapeutic measures will therefore be directed to removing as many as possible of these factors.

Heredity and nervous temperament undoubtedly predispose to the affection, for it is often observed in several members of the same family.

As first pointed out by Wm. H. Daly of Pittsburg, an undoubted relation exists between hay fever and certain pathological conditions of the nasal passages that may often be removed by appropriate treatment. Odor of roses and other fragrant plants are to be given an important place among the irritating elements which commonly excite an attack of hay fever. Other excitants are the pollen of Ambrosia artemisiæ folia, known also as Roman wormwood, rag-weed or hog-weed, or that of *Solidago odora*, known commonly as golden-rod; also dust and smoke, especially that of the railway; the pollen of certain grasses, as wheat, rye, oats, barley, or even Indian corn; also the dust of ipecac, salicylic acid, benzoic acid, and lycopodium. Excessive heat or bright sunshine will excite the attack in some individuals. Even imagined exposure to influences which have formerly excited an attack have been known to cause a return of the paroxysm, for example, proximity of an artificial flower or even the sight of a painting of a full-blown rose. These facts indicate a condition very like hysteria in some of the subjects of the disease, and in these particular cases would be a partial guide to therapeutics.

Though due importance must be ascribed to the neurotic element of the disease, and as well to external irritants, the local condition of the nasal mucous membrane must not be overlooked. There exists

in most, if not all, cases a hyperexcitability of the nasal lining that must be allayed to cure the disease. The attacks often return on exactly the same date of succeeding years, regardless of the temperature or other surroundings. But in many persons there is a variation of a few days, apparently dependent upon atmospheric conditions or the advance or delay of the season, so that when the summer is unusually early prophylactic measures should be adopted a week or ten days earlier than in other years.

There are two well-marked types of the disease—the *catarrhal* and the *asthmatic*—that demand different modes of treatment. The catarrhal form usually comes on with a sudden irritation of the mucous membrane of the fauces, conjunctivæ, and nares, accompanied by frequent sneezing. In the latter type asthmatic symptoms may develop very early, but usually not until after the nasal symptoms have existed two or three weeks. Often the nasal symptoms disappear, not to return again for the season, as soon as the asthma is developed.

The asthma in this affection is likely to occur during the daytime, instead of at night, and is usually worse on damp, hot days. The asthmatic type of the disease seldom develops until the patient has suffered from the catarrhal variety for from three to ten seasons.

The attack of hay fever generally begins with a tickling or stinging sensation in the Schneiderian membrane. This is accompanied by violent sneezing and itching of the conjunctivæ, with profuse lachrymation, or by burning or stinging sensations in the throat. In some persons the prominent early symptoms are severe neuralgic pains in the eyeballs or back of the head. Swelling of the eyelids, conjunctivæ, lips, or tip of the nose is frequently present, and may be the first indication of the attack. There may also be constitutional symptoms, such as elevation of the temperature, much prostration, and aching of the muscles. The fever calls for the administration of antipyretics, especially the salicylates, but when there is much prostration the valerianate of quinine is preferable.

The nasal mucosa is usually so swollen as to greatly obstruct the nares, and thus interfere with nasal respiration. In some cases this seems to be the immediate cause of the asthmatic attacks. Profuse watery, irritating discharge from the nose is nearly always present, and may sometimes be promptly relieved by atropine or similar remedies, though these remedies themselves cause even more discomfort than the disease. The discharge subsequently becomes mucopurulent and less irritating.

Hay fever is to be distinguished from simple acute rhinitis and spasmodic asthma. The history of previous attacks at the same season, the abrupt commencement, the excessive irritation, and the

occurrence of asthmatic paroxysms during the day constitute the essential points of difference. Hay fever occurring in young children and for the first time in adults may be very hard to diagnose, but the detection of exquisitely sensitive areas of the nasal mucous membrane by lightly touching it with a probe may serve to clear up the diagnosis.

The attacks vary daily in severity and usually continue from four to six or eight weeks, and may leave the patient in a debilitated condition for several months. After disappearance of the catarrhal symptoms the asthmatic attack may continue for a few hours or days and disappear suddenly, or they may last with incomplete intermissions until early winter. Most persons may escape the attacks by early change of climate, but the disease is apt to recur on return to the same locality during the hay-fever season. Some patients become less susceptible to the disease as they grow older. The affection, *per se*, is not dangerous to life, but the depression it causes may favor the development of serious disease.

Treatment.

As just stated, most patients may escape the hay fever attacks by a suitable change of climate. Even a change from the country to the city or *vice versâ* is sufficient with certain individuals. For most persons, however, the greatest relief is afforded in cool localities, such as are found along the Northern lakes, near the seashore, or at high altitudes where the land is not cultivated. Lake or ocean voyages will relieve some promptly, but the symptoms are very often aggravated by exposure to the wind and bright sunshine on the inland lakes. In America the most popular resorts for hay-fever patients are in the White Mountains of New Hampshire and in the region about Mackinac or Petoskey, Michigan. In fact, any place in the northern part of Michigan or Wisconsin where there is no cultivation would be a suitable place in which to live while the disease is prevalent. After the harvest the stubble-fields become covered with ragweed, which is apparently the most obnoxious of all the exciting causes, and as soon as any locality becomes much settled it is likely no longer to afford immunity from the disease.

No locality will be found suitable for all individuals alike, as some are affected more than others by the various exciting causes. As most of the patients are of a neurotic temperament, nerve-tonics are indicated, and it is better to begin their administration a month before the attack is expected, and to continue them until convalescence is established. Abercrombie[1] claims to have prevented the attacks for two successive years in one neurotic case by the administration of 3 grains of valerianate of zinc three times a day after eating. The various

[1] *British Medical Journal*, 1896.

preparations of quinine, strychnine, or arsenous acid, and asafœtida or some of the preparations of valerian, are most serviceable in warding off the attacks and in mitigating the nervous symptoms in those who are affected.

During the attack opium and belladonna, though either may give the patient great discomfort, are nevertheless often of great benefit. Atropine or hyoscyamus in small doses is especially beneficial in checking the profuse secretion and the tendency to sneeze. The local effects of inhalations of iodine, chloroform, or alcohol are occasionally very satisfactory. Weak solutions of lead acetate are recommended by Mackenzie for relieving the itching of the conjunctivæ. A solution of sodium biborate, grains 5 to 10, or of boric acid, grains 10, to the ounce of camphor-water, is most beneficial for this purpose. This can be used as often as desired for bathing the eyes. The lips and nostrils may be protected from the irritating effect of the secretion by applying the ointment of zinc oxide.

The nasal mucous membrane may be protected from severe irritation in some cases by wool plugs inserted in the nostrils to exclude the irritating substances. A spray of a saturated solution of boric acid will sometimes be found very grateful to the nasal mucous membrane. In some instances boric acid in camphor-water is better; in others the addition of small quantities of atropine, morphine, or cocaine may be necessary before much relief is experienced. In still other cases oily sprays are found more beneficial. A preparation containing about $\frac{1}{3}$ grain of thymol and about 3 minims of oil of cloves to the ounce of liquid albolene is most excellent. In some cases a small amount of the alkaloid of cocaine—not more than one-half of 1 per cent.—may be added with advantage. For general application a powder containing 3 or 4 per cent. of cocaine will be found more convenient. Care must be taken not to administer more than one-third of a grain of this drug a day, and even this dose should not be long continued. Patients are inclined to use the drug to excess, and on this account physicians should never give written prescriptions that may be refilled, and they should know exactly how much the patient is using.

When there are localized sensitive patches or areas in the nasal mucous membrane, the disease may be cured by judicious operative measures. These include the removal of nasal polypi or any spur from the septum that impinges upon the outer wall, linear cauterization along any hypertrophied or tumefied turbinated bodies, and, most important of all, the superficial cauterization of all places found to be extremely sensitive.

The superficial cauterization should be done with a flat electrode guarded on one side, so as to prevent burning the opposite wall, and

should simply scar the mucous membrane of an area not more than ten or fifteen millimetres in diameter. It should be done so as not to destroy the mucous membrane and leave cicatricial tissue. The cauterized part should be outlined on a diagram of the sensitive areas previously made. After four or five days a similar cauterization should be made over some other part of the sensitive area, preferably in the opposite naris. These operations should be repeated from time to time until the sensitive areas are completely covered and no part remains peculiarly sensitive to the probe.

After the cauterizations, as in the treatment of hypertrophic rhinitis, the patient may use a powder containing 3 or 4 per cent. of cocaine four or five times a day for a few days, and also an oily spray similar to that recommended above.

It may be necessary to perform from fifteen to thirty cauterizations in order to cover all of the diseased surface, and the following year a few spots may be found still sensitive, and these must be treated in a like manner. This treatment is not advised during the course of the hay fever, but is best carried out a few months preceding the attack.

From 40 to 50 per cent. of the cases thus treated are cured, about 25 per cent. are greatly benefited, and the remainder are sufficiently relieved of the nasal symptoms to well repay them for their discomfort during treatment.

Chromic acid, carbolic acid, and other caustics have also been recommended for cauterization of the surfaces, but they are much less satisfactory in their results than the galvano-cautery.

A change of climate during the season is to be made if possible, especially in cases of children, in whom there is reason to believe that the disease may be cured.

EPISTAXIS.

Epistaxis consists of hæmorrhage from the nose, and has its origin either in the nasal cavities or the adjacent sinuses. The nasal mucous membrane may be swollen or congested or may present a normal appearance, but generally erosion, ulceration, or a small bleeding point may be found upon the cartilaginous septum. In some cases the mucous membrane is thin, and the blood-vessels, being very near the surface, easily rupture upon engorgement from whatever cause.

The bleeding may come from the turbinated bodies, from the posterior nares, from the adjacent sinuses, or from the fragile surface of fibrous or malignant tumors. From these various conditions it will be seen that it is important to thoroughly understand each case before we attempt radical treatment. These bleedings are most frequent about the age of puberty, and are more common in early child-

hood or advanced age than in the prime of life. Occurring in advanced life, epistaxis is often a serious affection that may easily terminate fatally unless proper treatment is adopted.

As a prophylactic measure, the common local causes should be avoided. These are injury from picking the nose, violent sneezing, coughing, straining, and the inhalation of irritants. Polypi or other foreign bodies in the nasal passages may also cause hæmorrhage.

The constitutional causes demand judicious therapeutics. They are such as cause changes in the blood as illustrated in anæmia, plethora, eruptive and relapsing fevers, diphtheria, scurvy, purpura, and hæmophilia, or changes in the vessel-wall found in phosphorus-poisoning, acute yellow atrophy of the liver, Bright's disease, rheumatism, gout, and at times syphilis or chronic alcoholism.

Sometimes epistaxis has been known to take the place of menstruation or of habitual hæmorrhoidal bleeding.

In the plethoric and in fever patients flushing of the face or a sense of fulness of the head and buzzing in the ears may indicate the congestion that may precede the hæmorrhage; and these symptoms in the aged or in others with weak arteries would cause us to refrain from active interference unless the bleeding became profuse or frequently recurrent. The bleeding usually begins without apparent cause, frequently even while the patient is asleep. It commonly flows from one nostril in drops, which follow each other in rapid succession. As a rule, not more than a drachm of blood is lost, though the amount may seem much greater to the patient. In others the blood flows in a stream, and sometimes it is so copious as to prove fatal. Generally, when a large amount of blood is lost syncope results, and then the bleeding is liable to cease.

Most cases terminate spontaneously within five to fifteen minutes; therefore we must be careful not to ascribe too much virtue to the method first employed for stopping the flow. But in some instances the bleeding continues for several hours or days.

Epistaxis in children from no apparent cause, and that from injuries, is seldom if ever dangerous. Occurring in old people without injury or inflammation, it indicates a degeneration of the vessels and may prove serious. In subjects of hæmophilia bleeding is liable at some time to terminate fatally. Profound anæmia may result from oft-repeated and prolonged nasal hemorrhage. In malaria and plethora the bleeding may be beneficial, and in old people epistaxis often saves the patient from a stroke of apoplexy.

Treatment.—In most cases treatment is not necessary. When the bleeding is of a vicarious nature, in plethora, and in old people with atheromatous arteries it should not be checked unless it continues so long as to cause danger from anæmia.

When it becomes desirable to check the hæmorrhage we direct the patient to sit with the head erect, remembering that gravity plays its part here as elsewhere. The mere changing from the recumbent to the sitting posture, or holding the head erect instead of leaning over a wash-bowl, is frequently sufficient to arrest the flow of blood.

The bleeding in mild cases may be readily checked by cold applications to the back of the neck or directly to the nose, or by irrigation of the bleeding naris with hot water at a temperature of 120° to 125° F. As the bleeding is usually from a small point on the cartilaginous septum, continuous compression of the alæ nasi or of the septum for ten or fifteen minutes will often check it. Compression of the facial artery is also recommended, the artery, in certain cases, furnishing the blood-supply to the bleeding part.

In continued or severe bleeding other methods must be adopted. The insufflation of powdered matico-leaves or small quantities of tannin, or spraying with solutions of alum, 30 grains to the ounce; or tannin, 10 grains, or perchloride of iron, 20 minims to the ounce, will be found efficient in some cases. For continued hidden hæmorrhage hydrogen peroxide or hydrozone has been recommended. A drachm or more, being injected into the bleeding nares, is said to give almost immediate relief. It may also be applied on a loose plug of absorbent cotton. Maizonda[1] in a severe case of epistaxis, the ordinary remedies being unsuccessful, tried refrigeration by spraying ether into the nares, with the result of checking the bleeding.

Simple plugging of the nostril with cotton or lint and holding the head forward until coagulation has taken place is often sufficient. When the above measures fail it is necessary to plug the posterior naris, or, better still, fill the whole naris with a styptic antiseptic gauze tampon.

MacNamara in the epistaxis of purpura recommends a wine-glassful of spirits of turpentine in a tumbler of brandy- or whiskey-punch.

In epistaxis from other causes internal remedies may be given, together with the local treatment. For this purpose ergot, opium, and lead acetate are useful. To prevent recurrence the patient must avoid picking the nose, use warm douches and oils, and apply nitrate of silver, gr. x–xl to the ounce, to the ulcer or abrasion; or, better still, with the galvano-cautery, the point of which should be heated to a cherry-red, touch the bleeding point until the surface is thoroughly seared.

NASAL MUCOUS POLYPI.

Nasal mucous polypi are myxomatous tumors which grow from some part of the nasal mucosa, producing obstruction of the passages

[1] *Le Bulletin Médical*, Paris.

and excessive mucous discharge. They usually spring from the middle meatus or the external surface of the middle turbinated, though in a considerable number of cases they grow from the superior turbinated and superior meatus or from the ethmoidal cells. They occasionally take their origin in the antrum or frontal sinus, and very rarely start from the septum. Under the microscope these tumors appear like very œdematous connective tissue. They are composed in great part of myxomatous tissue, and are covered by mucous membrane. Polypi also contain blood-vessels and nerve-fibres. They are commonly pedunculated, but usually sessile. From these features it will be seen that they can be but little affected by local applications short of destructive agents.

Wokes holds that mucous polypi are caused by necrosing ethmoiditis, and Grünwald that they are secondary to empyema of the accessory cavities of the nose.[1] There seems, however, to be no sufficient pathological evidence in favor of either of these theories; nevertheless, in many cases, a continuous discharge of pus from the maxillary or other sinuses, or other discharges, as in ozæna or chronic rhinitis, seem to cause the disease. Polypi often grow without any appreciable provoking cause and with all the appearance of spontaneity.

These patients suffer from increased nasal secretion and more or less occlusion of the nasal passages, aggravated by damp weather or by colds in the head. Headaches are common, and the senses of taste and smell are often obtunded. The voice may lack the nasal resonance, and the patient may breathe through the mouth. A profuse watery discharge is common, and epistaxis is not infrequent.

Mucous polypi are to be distinguished from deviation of the septum, thickening of the turbinated bodies, chronic septal abscesses, foreign bodies, and from fibrous and malignant tumors.

Careful inspection with the rhinoscope and the use of the flat probe will usually serve to distinguish polypi from deviation of the septum, enlarged turbinals, and chronic abscesses. The secretion from foreign bodies is usually offensive; not so with polypi.

Fibrous and malignant tumors are usually of deeper color and more resistant to the touch. They bleed easily, and the malignant growths have a more irregular surface and cause more pain and disfigurement. In rare instances these growths become sarcomatous.

The affection, if not relieved surgically, continues for a lifetime, though spontaneous expulsion of one or more polypi may occur. They are likely to recur after removal, but local medication appears of some service in preventing this.

Treatment.—Numerous topical applications have been suggested

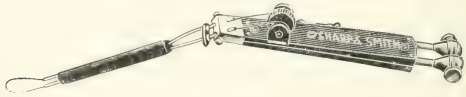
[1] *Annual of Universal Medical Sciences*, 1896.

for the cure of polypi, and various substances have been injected into them for their destruction. Among the latter are zinc chloride, iodine, alcohol, carbolic acid, and solutions of iron perchloride. The application of saturated solutions of potassium bichromate and the introduction of chromic acid into the tumor have also been recommended. Success appears to have occasionally followed these methods, but they have certainly generally failed; therefore we must resort to operative procedures in all cases when the polypi cause inconvenience.

Evulsion with forceps, the oldest method, is still commonly practised, but should give way to the more precise methods practised by laryngologists.

The galvano-cautery écraseur (Fig. 11) affords the advantage of searing and thus destroying the base of the polypi. The instrument

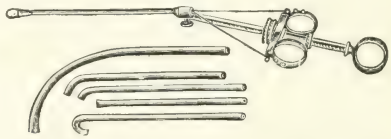
FIG. 11.



Galvano-cautery Handle with Écraseur Attachment (one-quarter size).

is, however, rather clumsy, compared with the ordinary steel-wire snare (Fig. 12), some form of which is now in general use by laryn-

FIG. 12.



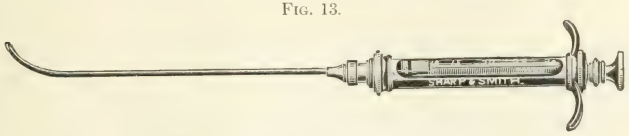
Ingals' Snare, with extra Tubes (one-quarter size, angle 25°).

gologists. It should be armed with No. 5 piano wire. The loop is passed from beneath up about the polypus, and with a backward and forward movement is worked up as near the base as possible. The loop is then firmly tightened and the polypus pulled off, unless it happens to be attached by a broad base, when it must be cut off with the wire. Sometimes both cavities may be cleaned at once, but it is better to remove what growths are in easy reach, and complete the operation in one or more subsequent sittings.

Occasionally, if not usually, the polypi bud again after removal, in which case the best treatment consists in thorough searing with the galvano-cautery while the buds are still small. For the primary operations or cauterizations the parts should first be thoroughly anæsthetized with a 4 per cent. solution of cocaine, which is best applied by means of a hypodermic syringe fitted with a long blunt silver

nozzle (Fig. 13), bent at the end so that the solution may be thrown up about the base of the tumors. After removal of the polypi we should make free use of a spray containing $\frac{1}{3}$ grain of thymol, 3

FIG. 13.



Hypodermic Syringe (one-half size). Silver nozzle.

minims of the oil of cloves, and 10 minims of terebene to the ounce of liquid albolene, which keeps the part clean and appears to have some effect in preventing recurrence.

Often operative procedures must be repeated several times until complete destruction of the growth is effected.

NASAL FIBROUS POLYPI.

Fibrous polypi are of extremely rare occurrence in the nose, but are not uncommon in the naso-pharynx. They are harder and bleed more easily than mucous polypi, and are not at all subject to medical treatment. They should be removed when possible by the natural passages by scissors, snare, or, better still, by the galvano-cautery écraseur, provided it can be accurately applied.

NASAL TUMORS.

NASAL papillary tumors are quite infrequent, but are occasionally found, varying in size from one to fifteen millimetres in diameter, and springing from the septum or lower turbinated body. They occasion symptoms of dry catarrh, with the signs of more or less obstruction.

Treatment.—These growths may be destroyed by nitric, acetic, or chromic acid, the curette, or the galvano-cautery, but in some cases they promptly return in spite of the most careful operations. In a most obstinate case of the kind I have seen, speedy cure from the application to the warts, two or three times daily, of the fluid extract of Thuja occidentalis, and the internal administration of drachm doses of the same. It is impossible to explain the modus operandi of this drug, but there can be no doubt of its beneficent effects, at least in some cases.

NASAL VASCULAR TUMORS.

Angiomata or vascular tumors of the nose are very rare. They do not appear amenable to medicinal treatment. Care must be taken

in their removal to avoid after-bleeding. If the cold-wire snare is used, the process of removal should occupy many minutes or even one or more hours. It would seem that the galvano-cautery would be the best instrument in these cases.

Nasal Cartilaginous Tumors.

True cartilaginous tumors, or ecchondromata, are seldom found in the nasal cavities, but a few cases have been reported. They closely resemble fibrous polypi; they are, however, sessile, generally growing from the cartilaginous septum, and if not interfered with may attain enormous size, causing great deformity of the face. The tumor is hard, but can be readily penetrated by a needle and does not bleed easily. If detected early before great deformity has resulted, the prognosis is favorable.

Treatment.—They may be removed most satisfactorily by the galvano-cautery écraseur, but may be destroyed by electrolysis.

Nasal Bony Tumors.

These very rare tumors are usually ovoid in form, and may be from a few millimetres to several centimetres in diameter, and may be dense or cancellous in structure. They usually have but little if any bony attachment, but are covered by periosteum and mucous membrane. These growths, as a rule, soon cause intense itching, which is later followed by nasal obstruction, offensive discharge, impairment of the sense of smell, and frequent epistaxis. Extremely severe neuralgic pains often result from the pressure of the tumor upon the adjacent parts. Deformity or perforation of the external parts may gradually take place.

Bone-tumors are distinguished from exostoses by their movability, larger size and darker color; from rhinoliths by the mucous covering and smooth instead of crumbling surface; from malignant growths by their slower growth and denser structure.

Treatment.—The treatment must be operative. After crushing the softer forms by means of strong forceps, the fragments may be removed. The hard variety, which is more common, may be ground down or drilled through with the dental burrs or trephines, and subsequently broken; but if very large, an external incision is usually necessary for their removal.

Nasal Malignant Tumors.

Malignant tumors of the nose are characterized by rapid growth, severe pain, nasal obstruction, offensive discharge, and frequent epistaxis. They are generally sarcomatous, but may be carcinomatous. On inspection their surface appears rather pale, nodular, or raspberry-

like, and bleeds easily when touched with a probe. The sarcomata usually spring from the osseous tissue, and may be osteo-sarcomata. The carcinomata take their origin from the mucosa. The latter are more likely to invade the adjacent lymphatics, and do not bleed as easily as the sarcomata.

These tumors cause alterations in the voice and other symptoms common to all nasal tumors. There are usually a greenish, offensive discharge, frequent epistaxis, and great pain in the infraorbital region. As the tumor grows the bony structures of the nose may be separated or pushed forward. The eyeballs may protrude and the tumor extend to the brain. Constitutional symptoms and the usual cachexiæ may follow later. If removed by operative measures, these growths speedily return, and usually run a rapid course, terminating fatally within six months.

Treatment.—Sedatives and astringents may be applied for palliative effect. Treatment by injections of toxins of erysipelas and bacillus prodigiosus has not proved successful. Thorough eradication, when practicable—which unfortunately is not often the case—is the only treatment that affords any chance of success.

SYPHILIS OF THE NOSE.

Syphilis of the nose is a local manifestation of constitutional syphilis, and may be primary, secondary, tertiary, or congenital.

The nasal mucosa may be ulcerated or simply thickened in patches, the latter condition sometimes being extensive enough to cause obstruction. Involvement of the periosteum or perichondrium sometimes happens, and suppuration with cartilage- and bone-necrosis naturally results.

Primary syphilis of the nose is rare. The secondary form is not infrequent, especially in infants, in whom it is apt to appear about the third or fourth month, its manifestations at that time being known to the laity as snuffles. Tertiary lesions are seldom noticed until several years after the initial lesion, but they may occur earlier. In the secondary stage there is profuse offensive muco-purulent secretion and more or less nasal obstruction, calling for frequent washing of the parts. Condylomata are sometimes present, and mucous patches are occasionally seen at the angle of the nostril or on the mucous membrane, and the fauces usually show evidence of the disease. In the tertiary stage necrosis of the cartilaginous or bony septum or of the turbinated bodies occurs, accompanied by a most offensive odor of dead and decaying tissue. The dead bone presents a blackish, rough surface, which imparts a grating sensation when palpated with the probe. Extensive destruction of the nasal bones causes falling in of

the bridge of the nose, and necrosis of the palate makes an entrance into the mouth. In rare instances, even when no dead bone is present, an offensive odor continues, even though the parts are kept clean by frequent washings. This condition can only be relieved by the free use of deodorants, such as thymol and aristol.

The secondary stage of the disease can be distinguished from simple chronic rhinitis by the history of its sudden onset with pronounced symptoms, by the mucous patches and condylomata when present, and by the history of the primary lesion when obtainable.

Lupus can be distinguished from the tertiary stage by its occurring at an earlier age than syphilis, excepting the hereditary form; by the peculiar reddish papules or tubercles of lupus; and later by its attacking the cartilage instead of the bone.

The odor of atrophic rhinitis, though offensive, differs from the penetrating stench of syphilis, and no necrosed tissue is found in the former disease.

In all doubtful cases old scars or induration of the tongue, pharynx, or larynx, and finally the beneficial action of potassium iodide, usually make it possible to make an accurate diagnosis, without which no intelligent treatment can be given. In mild cases secondary or tertiary symptoms usually speedily disappear under proper anti-syphilitic treatment, but after caries has taken place the prognosis is much less favorable. The severity of the disease appears to depend not only upon the virulence of the syphilitic virus, but also upon individual constitutional peculiarities.

Treatment.—For the treatment of the secondary stage mild constitutional remedies, together with local applications of tincture of iodine or silver nitrate to the mucous patches or condylomata usually suffice. More vigorous treatment, both constitutionally and locally, is demanded in the tertiary stage. Potassium iodide and sodium iodide in moderate doses, steadily increased if necessary up to their physiological limit, are of the utmost importance. In all cases some form of specific medication should be continued for about a year after active symptoms have disappeared. During the active disease of the nose the parts should be thoroughly cleansed two or three times a day with some alkaline wash. Topical applications of silver nitrate, gr. xl to 1 to the ounce, of sulphate of copper, gr. x to xx to ℥j, or full-strength tincture of iodine, should be made every day or two, if deep ulceration exists.

If dead bone is present, it must be carefully removed with forceps (Fig. 14), provided this can be done without force, or parts that cannot be thus removed may be cut away when within reach of the bone-forceps.

Congenital syphilis of the nose usually appears within the

first month after birth, and seldom later than the second month, but occasionally not until the eighth year or even later. The early symptoms are those of cold in the head with coryza, but within a few weeks the secretion becomes thicker, causing obstruction to nasal

FIG. 14.

Ingals' Nasal Dressing Forceps (three-fifths size).

respiration and emitting an offensive odor. Caries may ensue, causing disfigurement and extreme fœtor. Such children usually suffer from marasmus, and they are generally short-lived, but some are apparently cured.

Potassium iodide and preparations of mercury are indicated internally for their specific effects, and if possible local treatment should be carried out as recommended for syphilitic disease of the nose in adults. Ferruginous and bitter tonics, with malt, cod-liver oil, or other nutrients are of quite as much importance as the specific medication.

TUBERCULOSIS OF THE NARES.

THIS rare affection is characterized by the formation of tubercles of varying size, followed by ulceration and a fœtid discharge. It is caused by the bacillus tuberculosis, and is usually secondary to some other tubercular process. Thickening of the mucosa, with or without ulceration, is commonly present. The tubercles vary from two to thirty millimetres in diameter, but they are generally small and of a grayish-white color. The ulcers that follow may be single or multiple, and have a smooth grayish base and frequently raised edges. These ulcers are apt to appear upon the ala. The affection begins insidiously, and generally progresses slowly. The ulcers become painful, and later constitutional symptoms develop from the presence of tuberculosis of the lungs or larynx.

The diagnosis depends upon finding tuberculosis in other parts or upon detecting the bacilli in the discharges or scrapings from the ulcers. The disease may extend over many years. When other organs become involved, it runs a more rapid course, terminating fatally.

Treatment.—Tumors which obstruct the nares should be removed.

Lactic acid in varying strength, from 30 to 50 per cent., is of service in healing up the ulcers. The system should be fortified by tonics, and carbonate of creasote, oleum caryophylli, or other antiseptics should be given internally in large doses long continued.

LUPUS OF THE NARES.

Pathologists now generally recognize lupus as a tubercular disease, but there is still much doubt on the subject, so we here describe it briefly under the old name. The disease usually begins on the cartilaginous septum in the form of small red, irritable nodules. These gradually coalesce, forming uneven patches which later become ulcerated. The disease slowly invades the surrounding tissues, destroying soft tissue, cartilage, and even bone. While the destruction is extending a process of healing by white scar-tissue may be taking place at some points. The disease is not usually painful, but is accompanied by more or less offensive discharge, demanding mild alkaline detergent washes.

Treatment.—The local treatment consists in the removal of the diseased tissue with knife, curette, caustic, or the galvano-cautery. After thorough curetting lactic acid may be applied repeatedly until the reparative process is established. Nitric acid, caustic potash, and zinc chloride are also sometimes used for the same purpose.

DISEASES OF THE NASAL SEPTUM.

Deflection of the Nasal Septum.

Deflection of the nasal septum is one of the most common deformities of the nose. It is usually associated with thickening of the cartilage and bone or enchondroma and exostosis.

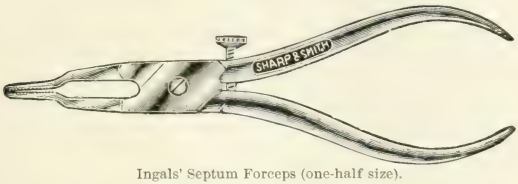
The cartilaginous septum, and sometimes the bony septum, or even both parts, may be bent to one side, the cartilaginous portion, as a rule, being chiefly involved. One naris is thus enlarged at the expense of the other. There is usually thickening of the septum, especially at the lower part of the concave surface. Comparatively few cases can be traced to injury, and I agree with Delavan that in most cases it is due to hypernutrition brought about by chronic congestion of the part. The patient seeks relief because of the obstruction to nasal breathing, collection of secretions in the nares and naso-pharynx, and the nasal twang to the voice.

Treatment.—Operative measures alone are capable of accomplishing much good in this affection.

In slight deviations most excellent results may be attained by making a crucial incision through the cartilage, the cut being made

obliquely so that the bevelled edges will easily slide past each other. The septum is then forced into place by forceps (Fig. 15), the vomer

FIG. 15.



Ingals' Septum Forceps (one-half size).

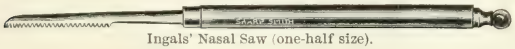
being fractured if necessary, and a gutta-percha plug or tube of sufficient size is kept in the obstructed nostril until union has taken place. In cases where the cartilage is bent almost at right angles the mucous membrane may be dissected up, a triangular piece of cartilage excised, the cartilage incised farther back to destroy its resiliency, and a plug placed in the obstructed nostril. Even then the cartilage may return to near its former position and prevent a satisfactory result.

Incisions made by a small trephine beneath the mucous membrane, and the removal of the cores thus made, seem to destroy the resiliency of the cartilage better than other means. The after-treatment is the same. Perfect results are difficult to obtain.

ENCHONDROMA AND EXOSTOSIS OF THE NASAL SEPTUM.

Enchondromata and exostoses of the nasal septum consist of thickening of the cartilaginous and bony parts of the septum with a more

FIG. 16.

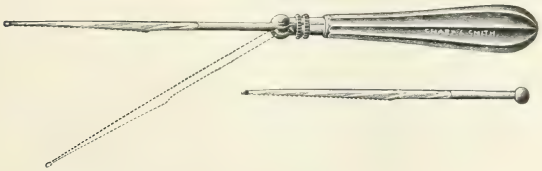


Ingals' Nasal Saw (one-half size).

FIG. 17.

Ingals' Flat Nasal Saw (two-fifths size).

FIG. 18.



Adjustable Nasal Saw.

or less prominent outgrowth or spur in most cases, and usually some deflection. The spur may be small, or so large as to impinge upon the outer wall of the naris and produce severe neuralgic pains.

Treatment.—The obstruction may be completely removed by suitable operation. Before operating both surfaces of the septum should be anæsthetized by the application of cocaine. An effort should be made to save as much mucous membrane as possible. Enchondromata may be cut away with the knife or by the trephine. They can also be thoroughly removed in from one to three sittings without hæmorrhage by electrolysis.[1]

Exostoses may be removed by saw or trephine and burr. The saw (see Figs. 16, 17, 18) is quicker and more accurate, and should be employed when possible. Perforation of the cartilaginous septum should always be avoided, and an opening in the bony septum should not be made if sufficient room can be secured without it.

Perforation of the Nasal Septum.

Perforation of the septum is often found as a result of syphilis, but it also not infrequently occurs in persons of low vitality or following typhoid fever, pneumonia, and phthisis.

Treatment.—The treatment consists in making suitable applications to heal any ulceration which may be present. Operative interference is not necessary, would be very difficult, and would result in very little if any good.

Hæmatoma of the Nasal Septum.

Hæmatoma is the name given to a collection of blood between the deep layers of the mucous membrane and the underlying cartilage of the nose. It usually results from fracture of the bony or cartilaginous septum, and presents a smooth, purple swelling just within the nostril, usually soft and fluctuating, and symmetrical on both sides. Hæmatomata usually eventuate in a few days in abscesses, and terminate with recovery, leaving a perforated septum as a rule.

Treatment.—First try cold applications. If suppuration takes place, evacuate upon one side, this usually being sufficient to drain both sides.

Abscess of the Nasal Septum.

These abscesses may be acute or chronic. They are found in the same position as hæmatomata, just described. They may result from the latter or follow simple inflammation of the parts. Redness and swelling of the dorsum of the nose and neighboring parts always

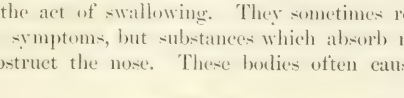
[1] Casselberry, *New York Medical Journal*, Aug. 31, 1895.

exist. The treatment is essentially the same as that of hæmatomata of the septum.

FOREIGN BODIES IN THE NOSE.

Beans, peas, buttons, or pebbles are the most common foreign bodies found in the nose. They are usually placed there by children, and often by insane people. Occasionally bodies are lodged in the nose during the act of swallowing. They sometimes remain a long time without symptoms, but substances which absorb moisture soon swell and obstruct the nose. These bodies often cause headaches,

Fig. 19.



Gross's Instruments for Removing Foreign Bodies from the Nasal Cavities and Ears.

but the most characteristic feature is a more or less profuse and offensive discharge from one nostril. A foreign body in the nose is to be distinguished from other causes of nasal obstruction and simple catarrh by the history, by the offensive discharge from one nostril, and by careful inspection and palpation with the probe. The application of cocaine often assists in detecting foreign bodies. Such cases are often treated for months, or even years, with douches or sprays by careless physicians, but necessarily without benefit.

Treatment.—The nasal cavity should be cocainized and the substances removed with forceps, catheter, probe, hooks, screws, douche, or snare, the latter being the most generally applicable. Mild alkaline antiseptic washes may be used for a week or ten days thereafter.

Rhinoliths.

Rhinoliths are concretions in the nasal cavities. Phosphate of lime is gradually deposited around a foreign body, forming a rhinolith, which is hard and rough on the surface and often softer toward the centre.

The symptoms are similar to those caused by a foreign body, the most characteristic being the offensive discharge from one side. If imbedded in the mucous membrane, there is apt to be ulceration and bleeding. They may remain many years, causing much annoyance, but are not dangerous to life.

Treatment.—They may usually be removed with polypus-forceps or the snare, or they may sometimes be crowded back into the nasopharynx and thus expelled. If necessary, they can be broken up by means of nasal bone-forceps and removed in fragments. The same after-treatment is desirable as for foreign bodies.

MYIOSIS NARIUM.

Myiosis narium, or maggots in the nose, results from the hatching of eggs deposited by flies in or near the nostril. This disease usually causes much destruction of the soft parts and may destroy even the bone. There are offensive discharge, severe pain, insomnia, and occasionally convulsions. The mucous membrane becomes first irritated, then crawling sensations may be experienced. Inspection of the nares reveals the presence of the maggots. As many as two or three hundred have been expelled from the nose in a single case. If neglected, the case may prove fatal.

Treatment.—Inhalations of chloroform may suffice for the destruction of the parasites. But if this is not sufficient, the patient should be anæsthetized and pure chloroform injected into the nasal cavities with a syringe. This does not appear to injure the mucous membrane severely, but would be very painful without complete anæsthesia. Bond of London[1] successfully used dilute Mandl's solution, 15 minims to the ounce.

DISORDERS OF THE SENSE OF SMELL.

Parosmia is a perverted sense of smell, the patient experiencing sensations of odors, usually disagreeable, which are not present. It is quite common among epileptics and the insane. It may be present constantly or only at times.

The disease is very frequently associated with anosmia, and may have for its seat the distribution of the olfactory nerves, in which case local treatment, as described under Anosmia, may yield satisfactory results.

Anosmia is the loss of the sense of smell. It is dependent upon obstruction in the nares or disease of the olfactory nerves or their cerebral centres. It may be unilateral or bilateral, and may come and disappear for a time, and return again, without apparent cause. When due to mechanical obstruction, anosmia disappears with the removal of the cause. When due to catarrhal inflammation of the nasal mucous membrane, recovery usually occurs, unless it is of two or three years' standing. If of cerebral origin, recovery seldom occurs.

Treatment.—The cause should be removed if possible. When this cannot be detected, Mackenzie recommends the insufflation of a powder containing $\frac{1}{24}$ grain of strychnine with 2 grains of starch, twice a day if necessary. Joel of Mont-Dore[2] cured two cases of loss of smell and taste which had existed for several months, and which had been unsuccessfully treated by irrigation, the galvanocautery, electricity, and strychnine insufflations, by the employment of carbon dioxide gas applied by an ordinary seltzer siphon. This

[1] *Journal of Laryngology*, May, 1896.

[2] *London Lancet*, 1895.

was turned upside down, the excess of liquid allowed to escape through the tap, and the orifice then placed close to the nostrils.

DISEASES OF THE ANTRUM OF HIGHMORE.

Tumors of the antrum are not at all uncommon. They usually originate from the alveolar border. They are, in the order of frequency, carcinomata, sarcomata, osteomata, fibromata, myxomata, and cysts.

Benign growths can be removed by exposing the interior of the antrum though the necessary incision and opening into its anterior wall.

In malignant growths the operation consists essentially of removal of the upper jaw. In many cases operation is contraindicated on account of the age of the patient, his low vitality, or the involvement of inaccessible parts; in which case nothing but palliative measures can be employed.

Empyema of the Antrum of Highmore.

Empyema or abscess of the maxillary sinus is a common affection resulting usually from caries of the root of a tooth, but also from inflammatory lesions of the nares, and sometimes from nasal polypi. The affection is attended by pain radiating in various directions from the seat of the disease, swelling of the overlying tissues, in some cases more or less obstruction to the nose, discharge from one nostril, and a foul smell or taste which cannot be removed by nasal washes of any character. The discharge comes from one naris only, and is usually intermittent, occurring only in certain positions of the head. On inspection the pus may sometimes be seen entering the naris in the middle meatus. Tenderness may be elicited on palpation over the malar prominence on the affected side, and there may be marked redness of the gum corresponding to the side affected.

The disease may be mistaken for ozæna, disease of the frontal sinuses or of the ethmoidal cells, or for tumors, cystic growths, and foreign bodies in the antrum. Pus in the antrum may be detected by

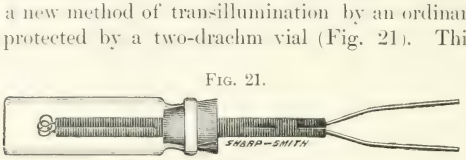
Fig. 20.

Ingals' Electric Lamp for Transillumination (one-half size).

injecting peroxide of hydrogen through the normal opening, when, if pus be present, a discharge of froth will take place. Transillumination often aids in a correct diagnosis. A small lamp (Fig. 20) placed

in the mouth of the patient in a dark room will cause a rosy illumination of the cheeks, lips, and lower eyelid on the healthy side. But if the antrum is filled with pus, the cheek and lower lid will remain dark. If the room cannot be darkened, a photographer's focusing cloth thrown over the heads of both patient and physician will exclude the external light sufficiently. Dr. Henry Ohls of Chicago has described a new method of transillumination by an ordinary cautery electrode, protected by a two-drachm vial (Fig. 21). This "home-

FIG. 21.



Dr. Ohls' Lamp for Transillumination.

made" lamp can be used in connection with any cautery battery. Care must be taken not to leave the current on too long at a time, for fear of burning out the electrode. Solid tumors and foreign bodies would also render the affected side opaque, while cysts light up more distinctly than the healthy cheek.

Cases are apt to be prolonged even under the most approved surgical measures.

Treatment.—When pus has formed, a free opening for its evacuation is usually necessary, although some cases have been cured by irrigation through the natural passages with pyrozone or other antiseptic solutions, applied with the long-nozzled syringe. This treatment, however, is usually difficult and unsatisfactory.

The antrum may be opened through the nose, through a tooth-socket, or through the anterior wall above the alveolus. Probably the best results are obtained by the opening through the tooth-socket. This can be accomplished by trephines or drills. The Brainaid conical bone-drill is a favorite (Fig. 22). The opening thus made will close in a

FIG. 22.

Brainaid's Bone-drill.

few weeks unless kept free by some form of drainage-tube, as for example, that illustrated in Fig. 23. Subsequently the cavities must be kept clean by irrigation with antiseptic solutions.

FIG. 23.

Ingals' Drainage-tube for Antrum (full diameter; three different lengths).

Various stimulating solutions or powders will also be needed, and care in plugging the opening before eating must be taken to prevent entrance of particles of food.

DISEASE OF THE SINUSES.

Empyema of the sphenoidal sinuses is a rare affection, and when found is very difficult to treat successfully. It usually causes severe headache, and is accompanied by a discharge of pus, which generally escapes through the naso-pharynx instead of the nostrils. The senses of smell and sight may be more or less disturbed. The abscess may open spontaneously, and, if not, the sinuses should be perforated and treated by irrigation, as in empyema of the antrum.

Inflammation of the frontal sinus may be acute or chronic. The acute form is the result of extension from the nasal mucosa or adjacent bone, or of direct infection through a wound. The chronic form is usually due to syphilis or tuberculosis. The chief features are pain and headache, a sense of weight and fulness in the forehead, with, usually, coryza. There are swelling, tenderness, more or less fever, rigors, and may be delirium. The situation of the duct of the sinus usually allows the escape of the inflammatory products, and in simple catarrhal cases a spontaneous cure results; but when swelling obstructs the duct the secretions distend the sinus and produce severe symptoms. The application of cocaine three or four times a day may reduce the swelling and allow the escape of the secretion, so that a cure follows.

The contents of the sinus may undergo suppuration, causing empyema, and demanding surgical interference. The sinus may be opened from the nasal cavity by a small drill, or from the external surface by trephine or chisel, the object being to institute thorough drainage of the cavity. Subsequent irrigation and stimulation are to be used as in suppuration of the other sinuses.

DISEASE OF THE ETHMOID CELLS.

Inflammation of the ethmoid cells usually causes severe neuralgic pains over the orbit and a muco-purulent discharge, generally from one side of the nose. Not infrequently small polypoid growths are associated with the ethmoid disease.

Treatment.—The object of the treatment should be to remove any obstruction to the free exit of pus and to render the parts as clean and aseptic as possible. The cells may be cleansed by injecting boric-acid solutions, pyrozone, or other antiseptics. The patient may advantageously use at home a stimulating antiseptic spray consisting of thymol gr. $\frac{1}{3}$, oil of cloves ♏ v, terebene ♏ x, to the ounce of liquid albolene. Washing the nose twice daily with an alkaline solution, as, for example, the Rhodes tablets (page 163) assist greatly in keeping the parts clean. But even with the most persistent treatment the disease

may last many months or even years, but a few cases seem to recover spontaneously.

RHINO-PHARYNGITIS.

Rhino-pharyngitis, commonly called post-nasal catarrh, is usually a chronic affection resulting from nasal obstruction. It is most frequent in a cold, moist climate, and is sometimes excited by a dusty atmosphere. Excessive smoking, drinking, and breathing bad air also produce the affection.

An examination with the rhinoscope discloses the presence of tenacious secretion coming down back of the soft palate, a collection of muco-pus in the naso-pharynx, or firmly adherent dry crusts extending from the pharynx up into the naso-pharynx. The mucous membrane usually appears congested. The posterior ends of the turbinated bodies may be enlarged or the mucous membrane at the sides of the vomer thickened. The orifices of the Eustachian tubes may be either swollen, congested, or occluded by secretion. There is a frequent desire to hawk and clear the throat of the viscid secretion, especially in the morning and after eating, the effort in many cases causing nausea or even vomiting. There are often a sense of dryness in the throat and offensive breath from decomposing secretions, and the hearing is often obtunded.

Treatment.—Many mild cases never apply for treatment. Well-developed cases require a great deal of patience on the part of both patient and physician. Direct causes, as nasal obstruction, adenoids, and the like, are to be removed. Exciting causes, as exposure and bad, unhygienic surroundings, must be avoided. The digestive organs must be kept in a healthy condition, and constitutional treatment is to be instituted if indicated. Locally, cleanliness of the nares and naso-pharynx is to be sought after. Gargles are seldom of much use, but sprays and washes are serviceable. Washing by snuffing the solution through the nose from the palm of the hand or by means of nasal or post-nasal syringes (Fig. 24) is efficacious in removing the secretions

Fig. 24.

Post-nasal Syringe (two-fifths size).

and preparing the parts for local applications. While using the wash the patient should keep his mouth open, and should be careful not to swallow. He must also use very little force, so that the fluid will not pass into the Eustachian tubes. The solution should be applied lukewarm. Dobell's solution or a simple alkaline preparation of

equal parts of sodium bicarbonate and sodium chloride, 1 drachm of the mixture to the pint of water, may be used, or Rhodes' tablets may be employed. After cleansing, astringent or stimulating powders are of much service. Much benefit is derived from the occasional use of a powder containing 1 part of berberine muriate to 1 or 2 of acacia. This should be gently forced through the bent tube of the insufflator up back of the palate, so as to cover the vault of the pharynx and lodge in the naso-pharynx, the patient being instructed to retain the powder as long as possible.

Some authorities recommend painting the surface with strong solutions, such as silver nitrate, 5 to 10 per cent., or tincture of iodine, about half strength.

For relief of the dry sensation an oily spray containing carbolic acid, from 2 to 5 grains, and menthol 1 to 2 grains to the ounce of liquid albolene, gives good results when applied to the diseased surface.

Throat Deafness.

Diseases of the nares and naso-pharynx often involve the Eustachian tubes and extend to the middle ear, thus causing most of the cases of deafness. Whatever causes obstruction to the Eustachian orifice or canal may induce rarefaction of the air in the tympanic cavity, and if long continued will cause depression, with inflammation and thickening, of the membrana tympani, and consequently more or less complete deafness. The patient usually complains of a sense of fulness in the ears and of rumbling, roaring, and buzzing sounds. Sometimes, if the deafness is due to obstruction at the Eustachian orifice, it will subside, or may be cured by mildly astringent or stimulating applications, like those already recommended for rhino-pharyngitis; but when much thickening of the lining membrane of the tube has taken place, with consequent changes in the middle ear, as in most cases of long standing, we may be well satisfied to check the progress of the disease and prevent an increase in deafness.

Treatment.—First find the cause, if possible, and if due to nasal or pharyngeal obstruction, such as caused by exostoses, tumors, adenoids, or the like, it should be removed by the methods recommended under their respective headings, and post-nasal catarrh must receive its appropriate treatment. When this does not suffice, direct treatment to the Eustachian tube is employed. It may be necessary to supply the drum-cavity with fresh air by means of Politzer's method, or, if the catarrhal inflammation has extended to the tympanic cavity, remedies may be introduced into the tympanic chamber by the Eustachian catheter, or by medicated oleaginous sprays thrown up behind the palate with an atomizer having a long bent tip, the nostrils and mouth being closed at the time, or thrown through one nostril, all escape at

the nostrils being prevented, as in using the Politzer bag. The treatment is taken up more in detail under Diseases of the Ear.

Retro-nasal Fibrous Tumors.

Polypi as they appear in the naso-pharynx usually originate from the periosteum, and may be almost entirely fibrous. The more fibrous in structure the more vascular they are. They may attain very large size, and produce great disfigurement, known as frog-face. The affection is rare, and occurs usually in children and young adults, the tendency to this growth usually disappearing by about the twenty-fifth year. These tumors cause nasal obstruction and frequent epistaxis, and appropriate treatment necessarily depends upon a correct diagnosis.

Treatment.—Fibrous tumors should be removed through the nares or naso-pharynx, if possible, by means of the cold-wire snare, galvano-cautery snare, or by electrolysis. On account of the firmness of the tissue and its vascularity, the galvano-cautery écraseur is preferred. When the tumor is of large size the operation assumes grave aspects and presents many difficulties, but in experienced hands the life of the patient is safer with the operation than without it. Medical applications to the surface are of very little value, excepting as detergents, and the author has seen one case where weak solutions of carbolic acid repeatedly caused hæmorrhage, apparently due to the carbolic acid, as other solutions did not have this effect. Injections of lactic acid, strength 20 to 35 per cent., with carbolic acid, 3 to 5 per cent., in water, preceded by a little cocaine, has proven very beneficial in reducing the size of the tumor and preventing recurrence after its removal.

Hypertrophy of the Pharyngeal or Luschka's Tonsil (also known as Adenoid Growths).

This condition consists of an abnormal enlargement of the glandular tissues normally found in the vault and walls of the pharynx. The hypertrophied tissue appears quite evenly distributed across the vault of the pharynx, and consists of increased connective tissue and lymphoid structure, such as is found in hypertrophied faucial tonsils. The new growth may be quite firm, but is usually soft and friable, and is generally of a pinkish-gray color.

The cause of the disease is not well understood, so that but little light from this source is thrown on its therapeutics. It is often congenital; it may follow the exanthematous diseases, diphtheria, and repeated colds; the rheumatic and strumous diatheses seem to predispose to it. It is found usually in children but occasionally in young adults. It is characterized symptomatically by obstruction to nasal respiration,

excessive nasal secretion, and, in many cases, partial deafness, with alterations in the voice. The general health is often much impaired and the chest deformed; this being very noticeable in one of a pair of twins, who has enlargement of Luschka's tonsils, while the other has not, but is larger, stouter, and better formed.

The patient comes or is brought to the physician complaining of some or all of the following symptoms: mouth-breathing, snoring, partial deafness, nasal obstruction, catarrh, talking as if he had a "cold in the head," restlessness, and poor sleep at night, bad dreams, general debility, and possibly impairment of the mental faculties.

Upon examination of the naso-pharynx with the rhinoscope nodular or pendulous masses of a gray or pinkish color, with a smooth surface, are detected. In young or unmanageable children it may be necessary to palpate the naso-pharynx before an accurate diagnosis can be made.

Treatment.—In a great percentage of these cases the enlarged glands, untreated, would atrophy at about the age of puberty. But it must not be forgotten that a great deal of permanent damage may result in the mean time to the general health, the hearing, and voice. In fact, the advice which some physicians give to allow the child to outgrow the difficulty has been characterized as criminal. Removal of the diseased tissue is advised in order to improve the general health, mental development, and formation of the face and chest; to prevent inflammation of the Eustachian tube and middle ear; to prevent permanent alteration in the voice and increased danger from zymotic diseases. Even when of long duration, removal of the disease results very, if not most, satisfactorily.

As pointed out by the author in the *Journal of the American Medical Association* in 1894, "it is not uncommon for young children to gain within six months after the operation from 20 to 40 per cent. in weight, and correspondingly in vigor and endurance."

Where opposition is raised to an operation, or when for other reasons operation is impracticable, some benefit may be derived from the administration of the syrup of the iodide of iron. Calcium chloride also might cause in some cases reduction of the hypertrophied tissue. Local astringents have proved of some benefit in a few cases.

Successful results are obtained by the use of chromic acid. The applications are made by fusing a few crystals of this caustic on the end of a flat aluminum probe, and passing it through the nostril and into the pharyngeal tonsil, where it is held a few seconds. The soreness which follows for several hours is not severe. The treatment is to be repeated every four or five days until the growth disappears.

For the direct removal of the growth several methods may be

employed. Many operators scrape the gland away by means of a long finger-nail or a sharp curette. The galvano-cautery, with a bent electrode, is used by others, but is painful and rather unsatisfactory. Probably the most satisfactory instrument for this purpose is Lowenberg's forceps, or, better, John N. Mackenzie's modification of this instrument. In adults local anæsthesia by cocaine is usually a sufficient preparation for the operation, but in children chloroform anæsthesia is advised; in fact, a general anæsthetic is held necessary for a thorough removal of the growth. The final result, as stated above, is most satisfactory to the physician and friends of the patient.

The subsequent treatment should consist of mild antiseptic sprays and powders thrown through the nares. Those recommended after cauterization of the turbinated bodies answer an excellent purpose.

DISEASES OF THE UVULA, THE PHARYNX AND LARYNX.

By D. BRADEN KYLE, M. D.

While not including in the subjects treated in this article all those within the scope of the specialist, it is our aim to treat those most frequently seen in general practice, and, beside the treatment, as far as possible to give the points in pathology and etiology upon which any special treatment is based. The treatment given is that which my own clinical experience has proven to be most beneficial. Although others may obtain equally good results from other lines of treatment, to add these plans would not only exceed the space allotted to this article, but would also, by a multiplicity of drugs, add confusion.

DISEASES OF THE UVULA.

Diseases of the uvula without involvement of surrounding structure are of rare occurrence. There are, however, a few localized pathological conditions which demand at least brief notice.

Elongation of the Uvula.

Elongation may occur from a number of causes. In anæmic individuals, from general weakness, causing loss of muscular tone, there may be relaxation of the uvula giving rise to all the symptoms of elongation. In such cases general treatment should be instituted for the relief of the anæmia and for the improvement of the muscular tone. Should the symptoms produced be of sufficient severity, such as persistent irritating cough, asthmatic or choking attacks, or spasm of the glottis, demanding immediate relief, the application of strong astringents, such as nitrate of silver, 10 to 15 per cent. solution, or 10 to 20 per cent. chromic acid, every second or third day will give temporary relief. No local applications regardless of the cause will give permanent relief. The best results can be obtained by the forcible pinching of the tip of the uvula by means of ordinary forceps, or by the use of the hæmostatic forceps, being careful not to compress the tissue sufficiently to cause devitalization. When elongation occurs from involvement of structure in the naso-pharynx,

causing depression of the soft palate, thereby forcing the uvula down, the treatment should be directed to the offending structures and not to the uvula; the same is true where relaxation is due to partial paralysis following scarlet fever, diphtheria, and allied conditions. The common cause of permanent elongation is continued catarrhal inflammation of the posterior nasal cavity and naso-pharynx, causing not only elongation, but chronic thickening. Treatment should be instituted for the relief of the catarrhal condition, and, if the elongation is sufficient to produce pharyngeal irritation and constant hacking cough, relief can often be obtained by the compression method given above, the pressure being sufficient to set up considerable inflammatory process with subsequent organization and contraction. Should this procedure fail, the removal of a portion of the tip of the uvula is necessitated.

For this operation a number of special instruments have been devised and various methods suggested. These instruments are all no doubt useful, the objection to them being that they necessitate a straight cut, the portion removed leaving the entire tip denuded of epithelium with a flat scar resulting. If the uvula be rendered insensible by the application of a 3 to 5 per cent. solution of cocaine and the tip grasped firmly with a pair of ordinary straight forceps, care being taken to exert little or no traction, a wedge-shaped portion, with the point of the wedge up (the portion removed depending, of course, on the extent of elongation), can be removed by means of a small sharp bistoury—the advantages of this procedure being that the two flaps thus formed close together, leaving a mere line of scar and yet forming a long line for contraction, also that the lateral flaps protect the cut surface. This method requires no special instrument and in my own experience has been highly satisfactory. Care should be taken not to remove too much of the tissue. After the removal of the portion of the uvula, the parts should be sprayed every three hours with an antiseptic alkaline solution such as—

℞. Sodii bicarbonatis,	gr. viij (0.5);
Acidi carbolici,	gtt. iv (0.25);
Glycerini,	♏ xv (1.0);
Aquæ,	q. s. ad f℥j (30.0).—M.

The patient should be directed to take no irritating foods for twenty-four to forty-eight hours. No irritating condiments should be used.

Hæmorrhage after Uvulotomy.—Usually the simple operation of uvulotomy is not attended by any serious results, the hæmorrhage occurring being only slight. When hæmorrhage does occur it is usually of such severity that the ordinary hæmostatics are of no avail.

The simplest method for the arrest of the hæmorrhage is to use the ordinary needle-holder carrying a curved needle, threaded with double silk thread, having the ends of sufficient length to permit of tying outside the mouth. The needle should be passed through the uvula laterally just above the cut surface and each thread tightened sufficiently to arrest the bleeding. This ligature will not necessitate any sloughing, with subsequent secondary hæmorrhage, as it can be safely removed in a few hours and sufficient clotting will have occurred before it has caused any destruction of tissue.

Ulceration of the Uvula.

Ulceration of the uvula is usually associated with ulceration of the adjacent structure, occurring in syphilitic and tubercular conditions or in any of the specific inflammatory processes. In such cases the treatment should consist of local cleansing of the parts by means of hydrogen peroxide, followed by an alkaline antiseptic wash such as boric-acid solution, 10 grains to the ounce, or the following:

℞. Sodii biboratis,
Sodii bicarbonatis, āā. gr. viij (0.5);
Acidi carbolici, vel
Toluol, gtt. j vel v (0.05–0.3);
Glycerini, gtt. xv (1.0);
Aquæ, q. s. ad f℥j (30.0).—M.

Also the administration of constitutional treatment as indicated in the articles devoted to the treatment of those special diseases. Ulceration following catarrhal processes should be treated by the same cleansing method, the surface dried, and then some stimulating powder should be applied. The stearate of zinc, containing salicylic or boric acid 30 to 60 grains to the ounce, should be used. The catarrhal ulcers are usually situated on the posterior part of the uvula and are often overlooked, therefore a careful rhinoscopic examination should be made in the cases of post-nasal catarrh in which the individual complains of the constant presence of secretion just above the palatine folds.

Œdema of the Uvula (Uvulitis).

As a rule, the sudden inflammatory process involving the uvula and producing œdema also involves the pharyngeal structure, but from localized irritation or trauma it may be limited to the uvula alone. It suddenly becomes swollen, boggy, and sacculated, producing a constant pharyngeal irritation and consequent cough, and causes pain on swallowing, especially when taking food. The uvula

may become so enlarged as to almost entirely cover the pharyngeal wall. When the process is rapid, causing sudden œdema, the surface should be coated over with a 10 per cent. solution of cocaine and the œdematous tissue filled with multiple punctures by means of a sharp-pointed bistoury, or, better, the double-cutting aspirating needle. During the puncturing, protection should be afforded the pharyngeal wall by placing back of the uvula some solid body; the short curve of an ordinary double retractor answers very well. After the puncturing the tissue should be thoroughly cleansed and coated over with some mild astringent such as tannin, 3 to 5 per cent. solution, or a weak solution of sulphate of copper, 1 to 3 grains to the ounce. Splendid results may be obtained by spraying the parts, after the puncturing, with ice-water.

Tumors of the Uvula.

Tumors of the uvula proper and not involving the adjacent structures are rare. Occasionally it may be the site of single or multiple papilloma. The tumor should be removed by means of the biting forceps, being careful to produce as little laceration of structure as possible, the necessary wound being treated by a cleansing alkaline solution.

Bifid Uvula.

This condition exists quite frequently, and although in itself it is strictly a malformation and not a diseased process, yet it may, owing to its shape, extent, and faulty action, give rise to tickling of the pharynx, followed by an irritating, hacking cough. Instead of removing one portion of the uvula, the inner surfaces of the two portions should be denuded, permitting the contact of the two granulating surfaces, and thereby forming complete union. If there has been slight elongation, the contraction following the scar-tissue formation will be sufficient to correct it without the removal of any structure.

DISEASES OF THE PHARYNX.

Acute Pharyngitis.

An acute inflammatory process involving only the pharyngeal wall may occur, but as a rule there is involvement of adjacent structures; even in less severe cases the posterior pillars are involved, while in severe cases the anterior and posterior pillars, the uvula, tonsil, and peritonsillar tissue are implicated.

The lesion may be due purely to a local irritation or may be a

local manifestation of some constitutional condition, or may be associated with or occur as a sequel of the latter. The symptoms produced, regardless of cause, are very much the same, and plans of rational treatment are naturally based on the etiological factors, either primary or secondary. First, then, treatment for the immediate relief of the distressing symptoms; and, second, the appropriate treatment for such conditions, constitutional or local, which may give rise to attacks of acute pharyngitis. For example, the attack may be due to intestinal or gastric irritation, or to a gouty or rheumatic diathesis; the general treatment, therefore, should be directed to the relief of the underlying cause. It must also be remembered that acute pharyngitis is frequently associated with, or really a continuation of, an acute inflammatory process of the post-nasal cavity. In such cases the treatment should be directed more to the naso-pharynx than to the pharynx proper. In the treatment of an acute inflammatory process of the pharynx it should also be borne in mind that for the performance of physiological function the tissue is richly supplied with blood-vessels and epithelial cells, and that after desquamation the surface epithelium is rapidly reproduced from its dense genetic layer. Besides the conditions mentioned above as etiological factors it must be remembered that the administration of certain drugs that are eliminated by the mucous membrane may be the cause of the inflammatory process. Of such drugs the iodine, bromine, and phosphorus preparations may be named. Their prompt withdrawal is usually the only treatment necessary.

When the inflammation is limited to the pharynx—and by the pharynx is understood that portion of the wall that is visible on oral inspection—the remedial agents should and can be applied directly to the part; this can be done in a number of ways: by means of gargles, sprays, the direct application by means of cotton and applicator, or in the form of lozenges. If the patient is seen in the early or first stage of the inflammatory process, the treatment indicated is vastly different from that demanded when it has reached the second or exudative stage. It must be remembered that in the first stage the pathological alteration is not a structural one, but is entirely limited to the vessels; that the mucous membrane has its normal lubricating secretion, which is furnished by the mucous glands located in the submucosa; that in the first stage, or stage of engorgement, the pressure exerted by the now over-distended arterioles and capillaries cuts off this normal secretion by the temporary occlusion of the excretory ducts, and therefore the surface will be dry and irritated. The object of treatment in this stage should be depletion and the rapid relief of the vascular engorgement. To accomplish this the same principles that are applicable to any other localized inflammatory

process should be employed here. The local or constitutional application of such agents as cause relaxation of tissue will bring about depletion, if not more rapidly, at least more in accordance with Nature's process, than by the application of astringents or remedies which contract the tissue. While it is possible to relieve the engorgement and cause contraction of the vessel, and even re-establish circulation and secretion in local spots of inflammation, yet the irritation produced by the application of such remedial agents to the delicate mucous-membrane surface may augment the very condition you are aiming to relieve. Instead, then, of the application of such solutions as iodine, nitrate of silver, etc., there should be administered locally and internally such drugs as pilocarpine, apomorphine, ipecac, tartrate of antimony, and other drugs in the same line. These should be administered in small and frequently repeated doses. An effervescing tablet containing $\frac{1}{100}$ of a grain of pilocarpine allowed to dissolve slowly in the mouth and repeated every hour for three or four doses will usually give relief.

The administration of drugs which act on the vasomotor system causing contraction of the vessel-wall may give the desired result and is preferable to the local application of any irritating agent. If the inflammatory process be localized, astringents may be used with good results, but if the process involves the entire pharyngeal surface they should not be used. If the throat is irritable or the raw feeling is present of which the patient so frequently complains, local sedatives should be used. The parts should be sprayed with a bland oil containing three drops of oil of sandalwood to the ounce, the oil of sandalwood being decidedly sedative to the mucous membrane and the bland oil serving the double purpose of a lubricant and a protector. To some patients the oily preparations are decidedly disagreeable; in such cases the surface may be sprayed with a weak cocaine solution not stronger than 2 or 3 per cent., the object being more to relieve the irritation than to cause contraction of the vessels. When menthol is used for the relief of this condition it should not exceed two grains to the ounce. If used in combination with camphor, much better results are obtained. The following usually gives relief:

℞. Camphoræ,	gr. ij (0.10);
Menthol. (crystal.),	gr. ij (0.10);
Olei santali,	gtt. iv (0.2);
Alboleni (liquid.),	f℥j (30.0).—M.

It is rarely necessary to administer internally drugs for the relief of this condition. Should the severity of the symptoms demand internal medication we have in codeine in small doses the best re-

medial agent. When the pharyngitis is not dependent upon purely local conditions, but is caused by gastro-intestinal or hepatic disturbances, immediate attention should be given to the gastro-intestinal tract. A purgative should be given, followed by a saline; such as the administration of one to three grains of calomel to one grain of compound colocynth powder, followed by a saline that will stimulate glandular secretion. This can be accomplished by the administration of two to four drachms of the granular effervescing phosphate of sodium, which may be repeated three times daily.

In the second or exudative stage where the vessels and glands have relieved themselves of engorgement, very little medication is required. If the secretions are profuse and tenacious the membrane should be cleansed with a simple alkaline wash. If the inflammation is localized, due to any of the above cases, and does not involve the entire pharyngeal surface, astringents may be used. Such solutions as tannin, 5 to 10 grains to the ounce; alum, 5 to 10 grains to the ounce, or chlorate of potash, 10 to 15 grains to the ounce, should be applied by means of sprays, or, better, by means of cotton and an applicator. When the inflammation is localized to the margins of the pharyngeal wall, which is often the case if dependent upon gastro-intestinal irritation, relief can be obtained by the use of a mild astringent such as the compound tincture of benzoin with equal parts of 50 per cent. boro-glyceride. Should the second stage not pass rapidly on into resolution, the hypersecretion and elaboration of mucus can be controlled by the administration of minute doses of belladonna in the form of atropine, or aconite in the form of aconitine—of either, the $\frac{1}{300}$ to $\frac{1}{400}$ of a grain—not repeated oftener than every three or four hours and only to the point of beginning physiological effects. These drugs apparently have a specific action on the faucial circulation. It is not necessary to confine the patient to his room unless the severity of the local condition leads to threatening constitutional symptoms.

Simple Chronic Pharyngitis.

Chronic pharyngitis is usually a secondary condition, not secondary to repeated attacks of acute inflammation, but associated with, or dependent upon, pathological lesions elsewhere, such as chronic naso-pharyngitis, gastro-intestinal irritation; cardiac, hepatic, or renal changes; also such conditions, as rheumatism and gout, where, by the presence in the blood and secretions of uric acid, and by its elimination from the mucous-membrane surface, there is established a slow chronic inflammatory process with increase in the connective-tissue elements. Generally in valvular lesions of the heart, especially mitral disease, there is a slowed venous circulation; in such cases there is a cyanotic condition produced in the mucous-membrane surfaces,

especially those surfaces which are surrounded or backed up by bony or cartilaginous wall; this is especially noted in the mucous membrane of the pharynx as well as in the continuous and contiguous structures. When due to obstructed circulation the thickening produced is entirely within and dependent upon the over-distended vessels, and thus the real condition existing in the tissue is that of a pressure-atrophy. This same condition may be produced by lesions of the kidney and liver in which, from fibrous contraction due to interstitial inflammatory processes, there is interference with the general circulation and secondary cyanosis of mucous membrane. These important points must not be overlooked, as curative treatment and accurate prognosis depend entirely upon their recognition.

As this condition is largely a secondary one the treatment should be directed toward the underlying etiological factor, as local treatment will be only palliative until the active cause has been removed. It would be impossible in this article to outline plans of treatment for the many underlying causes. For the relief of the local irritation and diminished secretion which are influenced by atmospheric change, stimulating solutions should be used. In the essential oils we have possibly the best remedial agents. The topical application by means of cotton and probe of the following I find to give the most relief:

℞. Ol. picis liquidæ, gtt. x–xx (0.65–1.3);
Ol. olivæ, f ℥j (30.0).—M.

Or,

℞. Ol. pini sylvestr., gtt. x–xx (0.65–1.3);
Ol. eucalypti, gtt. v–x (0.3–0.65);
Alboleni (liquid.), f ℥j (30.0).—M.

Stimulating action may be increased by adding to the above 1 grain of menthol. This will increase normal secretion, lessen the dryness, and by so doing lessen the tendency to accumulation on the surface and thereby liability of lodgment of bacteria. If the alteration in the tissue be truly chronic, with the formation in the submucosa of new connective-tissue elements leaving permanent thickening, or, from the over-distended vessels in cyanotic conditions, with subsequent atrophic changes in the epithelial and connective-tissue structures, a permanent cure cannot be effected. Should the patient be addicted to the use of tobacco, especially excessive smoking, its use should be prohibited.

Follicular Pharyngitis.

This condition is limited strictly to the pharyngeal mucous membrane and is an involvement of the muciparous glands and surround-

ing lymphatic structure; it occurs more frequently in individuals of a lymphatic temperament and a highly nervous organization. It may occur at almost any age, the most aggravated form occurring in individuals whose occupation requires continued use of the voice, and it is seen in what is called "clergyman's sore throat." Besides the number of small round nodules there are also present in the mucous membrane engorged and over-distended vessels. The treatment should be, first, the careful attention to the general health of the patient, and second, the local treatment of the follicles and engorged vessels. The patient's general condition should be improved by the administration of such tonic agents as the various preparations of iron, nux vomica, cod-liver oil, hypophosphites, etc. The constitutional treatment must depend entirely on the clinical indications presented by the patient, and must be determined by the practitioner. In the early or acute stage where permanent structure-change has not taken place I have obtained excellent results from the administration of drugs which are eliminated by the mucous membrane. The following should be administered three times daily:

℞. Phosphori,	gr. $\frac{1}{100}$ (0.0006);
Iodini,	gr. $\frac{1}{8}$–$\frac{1}{6}$ (0.008–0.001);
Bromini,	gr. $\frac{1}{8}$–$\frac{1}{6}$ (0.008–0.001);
Vini Xerici,	ʒj (4.0).—M.

The distressing cough and constant irritation can be relieved by the administration of codeine, in doses of one-twelfth to one-eighth of a grain, three or four times daily. As to the treatment of the actual follicle, the application of the galvano-cautery should be the last resort, as its use necessitates the destruction not only of the follicle but also some of the healthy surrounding structure, with subsequent fibrous-tissue formation, whilst the contraction is marked when due to burns, and the application of the galvano-cautery practically amounts to a burn. Each follicle may be touched with a 20 per cent. chromic acid solution, or the dilute hydrochloric acid. This can be done without contact to the surrounding structure if a fine-pointed applicator is used on the point of which is tightly wrapped a small portion of absorbent cotton; the cotton is saturated with the solution and the excess dried off with another piece of cotton and then applied directly to the follicle, using very little pressure. In more obstinate cases the simple puncturing of the follicle by means of a sharp-pointed applicator or probe is sufficient. The probe should be bluntly needle-pointed and with no cutting surface. Relief of the engorged vessels may be obtained in the same way. In many cases the above procedure will give permanent relief. Should the condition be chronic with fixed tissue alteration, the appli-

cation of the galvano-cautery is warranted. The needle should be fine-pointed and heated to a white heat and should be applied direct to the follicle, care being taken not to penetrate too deeply into the tissue and not to involve the healthy surrounding structure. I have seen cases in which a great number of follicles have been removed by the galvano-cautery several years previous, in which the condition of the pharynx, brought about by the extensive and possibly careless cauterization, was much worse than that originally produced by the follicular pharyngitis. When follicular pharyngitis is associated with naso-pharyngeal catarrh, treatment for the associated condition should be instituted.

While the excessive use of alcohol and tobacco do not cause follicular pharyngitis, yet they may aggravate the condition and their use should be prohibited.

Dry or Atrophic Pharyngitis (Pharyngitis Sicca).

Dry pharyngitis is usually spoken of as a chronic inflammatory process. It is in reality not an inflammatory process, but a pathological alteration produced in the mucous membrane secondary to such processes, and necessarily involves a number of causative elements. It may follow chronic pharyngitis, either simple or follicular, where, from fibroid-tissue formation in the submucosa, the vascular supply being diminished, there is subsequent atrophy. This contraction involves the submucosa and the muciparous glands, as well as the epithelial layer. Upon the amount of fibrous tissue and the alteration produced in the structure involved in the contraction, as well as the extent of the area involved, will depend the prognosis as to palliation or cure; for, if the process is well advanced, no amount of local or constitutional treatment will alter the already formed fibrous tissue or arrest its contraction. The process may be limited to the pharynx, or it may be subsequent to the same condition pre-existing in the anterior nasal cavity and naso-pharynx; when such is the case, the morbid process involving the true pharyngeal surface is somewhat different and is more amenable to treatment than when secondary to localized inflammatory conditions of the pharynx. This is true for the following reasons: The condition is brought about by mechanical irritation, instead of by spreading by continuity of tissue from the nasal mucous membrane. With atrophy of the mucous membrane of the nasal cavities there is marked enlargement of the space for transmission of air; this allows an increased volume of air to pass through the nasal cavities. Owing to the altered condition of the membrane, even the normal amount of air would not be physiologically altered in temperature and moisture, much less the increased volume. This in itself would act as an irritation to the pharyngeal wall. The cili-

ated epithelium has also lost its function owing to the atrophic process of the nasal mucous membrane; therefore the particles of dust carried in by the air, instead of lodging and being expelled, pass directly into the naso-pharynx and pharynx. Still another source of irritation is the lodgment in the naso-pharynx of the altered secretion, together with its infection by saprophytic bacteria. The fact that such cases are more amenable to treatment does not depend so much upon the structural alteration of the tissue as it does upon the fact that the pre-existing condition in the anterior nares and naso-pharynx directs attention to the pharynx proper, and treatment can be instituted early.

The varieties of dry pharyngitis due to other causes present the same appearance clinically, but differ very much in their structural alteration. For instance, in dry pharyngitis due to certain fumes or vapors the change is limited, at least for some considerable time, to the epithelial layer, and the discontinuance of exposure to such fumes will usually promote a rapid recovery. The variety seen in diabetes mellitus also presents very little structural change and requires no separate treatment other than that indicated in the article on that special disease. A mild variety of dry pharyngitis may be induced by nasal obstruction causing mouth-breathing. The treatment is obvious: remove the nasal obstruction. If this should be done early, before any structural change has taken place in the pharyngeal tissue, the irritated membrane will rapidly return to normal, but should the obstruction be of long standing, the condition of the pharyngeal tissue will be that induced by any chronic inflammatory process. Irrespective of cause the appearance presented by the mucous membrane is the same. The surface is dry and wrinkled and has the appearance of having been coated over with a thin layer of varnish. Localized masses of thick, tenacious secretion of a greenish or brownish color are frequently present; this gives rise to the sensation of a foreign body in the throat, causing cough and continual effort at expulsion.

It has been my own experience that solutions used by the patient rarely cleanse the membrane. While the patient should be given a solution for this purpose to use two or three times daily, to ensure perfect cleansing he should be seen by the attending physician at least every other day, or better daily, and the dried secretion be thoroughly removed, preferably by swabbing the entire surface with hydrogen peroxide and water equal parts, followed by an alkaline wash such as—

℞. Sodii bicarbonatis,
Sodii biboratis,
Sodii chloratis,
Potassii bicarbonatis, *āā.* gr. xv (1.0);
Aquæ, f℥ij (60.0).—M.

This solution should be as hot as can be borne by the patient. The membrane should be thoroughly dried by pledgets of absorbent cotton carefully mopped over the surface and a mild stimulating solution applied. Better results will be obtained by the direct application of such solutions than when applied by sprays. For the local stimulation one-half to one drop of oil of mustard to an ounce of albolene or liquid vaseline, applied every other day directly to the diseased surface, is the best agent. Equally good results can be obtained by using, after cleansing and drying the membrane, pledgets of cotton saturated with an ointment of ichthyol and lanolin equal parts, the pledgets being far back in the nostril from fifteen to thirty minutes or until there is marked stimulation of the membrane.

The object of such applications is to produce merely a hyperæmia of the vessels, and care must be taken not to set up too violent irritation or the resulting inflammatory condition will entirely offset the benefits of stimulation. Even after the most thorough cleansing of the membrane there is a tendency to the rapid accumulation of the altered secretion, and for the relief of the distressing symptoms caused by this accumulation there should be prescribed for the patient an oily preparation which not only lubricates the parts, but also softens the secretion. The following formula will produce the desired effect:

℞. Menthol.,	gr. v–x (0.3–0.65);
Alboleni, vel	
Vaselini (liquid.),	f℥j (30.0).—M.

The menthol is used owing to its slight local anæsthetic properties and for its beneficial stimulation to the circulation, this latter property possibly being the means of producing the anæsthetic effect.

The special constitutional treatment should consist in the administration of drugs which directly affect glandular secretion and are at least partially eliminated by the mucous membranes. In the general treatment, beside such agents as are administered for direct effect on the diseased area, it is well to give some drug that will ensure the regular and free movement of the bowels, not so much by its purgative action as by its stimulation of glandular secretion. For this purpose the phosphate of soda should be given in from 2- to 4-drachm doses in the form of the granular effervescing powder, twice or thrice daily, the frequency and size of the dose depending upon the therapeutic effect and the clinical indications. The iodides, in the form of iodide of potassium and sodium, from their therapeutic action on glandular secretion are unquestionably indicated and beneficial, but as the condition requires their continued use they are generally followed by the gastric irritation which the long-continued use of these drugs produces.

The arsenical preparations, however, are equally efficacious as remedial agents, and owing to their lessened tendency to produce gastric irritation are preferable. The best results will be obtained by the administration of from gr. $\frac{1}{24}$ to gr. $\frac{1}{16}$ of the double sulphide of arsenic given in pill form, three times daily after meals. Besides the special treatment given, appropriate remedies administered for the improvement of the general condition will aid materially in the successful treatment.

Tuberculous Pharyngitis.

Primary tuberculosis of the pharynx alone rarely ever occurs. It is usually subsequent to pulmonary or laryngeal tuberculosis. As to the treatment of the condition, the method is the same whether it be primary or secondary. The prognosis, however, is more favorable in the primary uncomplicated cases than in those associated with pulmonary or laryngeal lesions. The local treatment in any case is directed toward the alleviation of the intense pain and discomfort caused by the ulceration, as, with the exception of possibly an absolutely primary local lesion, a cure can hardly be hoped for. Owing to the fact that the patient's general vitality is much lowered, together with the presence of the specific infective agent, the healing of the ulcer is a slow and almost hopeless process. For the relief of the pain, which is aggravated by swallowing, the local application of a 5 to a 10 per cent. solution of cocaine will suffice. This, however, is only palliative, and from the chronic condition of the ulcer will necessitate the long-continued use of the drug, with the necessarily bad effects, not only locally but also on the general system. I have obtained equally good results, not only for the relief of the local irritation, but also from its cleansing as well as its slightly antiseptic action, by the use of the dilute nitric acid diluted in equal parts of water and applied directly to the ulcerated areas, either by means of an applicator or in spray form. A simple therapeutic agent which gives much relief is the juice of the pineapple, used as a spray or gargle; it is cleansing and acts as a slight astringent, also relieves the irritation and pain.

The treatment by curettement, while it may be a beneficial method, is questionable as a curative measure. For the healthy underlying structure is protected by the limiting membrane, peculiar to the specific inflammatory processes, which prevents spreading other than by continuity of tissue. Now, unless the curettement be thoroughly done and all of the infected area removed, the lymphatic system may be opened and further spreading take place. The most satisfactory plan of treatment is the thorough cleansing of the ulcer with an antiseptic alkaline solution such as—

℞. Sodii biboratis,
Sodii bicarbonatis, āā. gr. x (0.65);
Acidi carbolici, gtt. ij (0.06);
Aquæ, q. s. ad f℥j (30.0).—M.

The lesion should then be dried and an acid applied. Of the various acids used I have obtained the best results from the use of the dilute nitric or hydrochloric acid. This should be repeated two or three times a day. The application of powders such as iodoform, aristol, etc., is of doubtful value, besides being decidedly disagreeable to the patient. In the early or catarrhal stage the membrane should be cleansed and dried and a mild astringent applied, as tannin, 8 to 10 grains to the ounce; at the same time there should be administered internally carbonate of guaiacol in 1- to 5-grain doses, three times daily. The general condition should be improved, and such constitutional treatment as is recommended in the article on Tuberculosis should be administered.

Syphilitic Pharyngitis.

Of the three stages of syphilis the pharyngeal manifestations are most commonly seen in the secondary and tertiary. The primary lesion is rarely if ever met with in this location. With the recognition of the character of the lesion, internal medication should be instituted; in the secondary stage the mixed treatment, while in the tertiary the iodides alone are much more effective.

The details of the general treatment are too well known to necessitate repetition. Local treatment should consist first of thorough and repeated cleansing of the pharyngeal mucous membrane. This can be accomplished by the patient's repeatedly gargling or spraying the throat with a tepid alkaline wash as given on page 211. This should be followed by a gargle or spray of as hot water as can be comfortably borne by the patient. The areas of ulceration should be touched every other day with nitrate of silver, 20 to 40 grains to the ounce, or carbolic acid, 10 to 20 per cent.; or liquor ferri sesquichloridi, 4 parts; toluol, 36 parts; absolute alcohol, enough to make 100 parts (Löffler's solution). It is understood that the solutions given are not of the strength usually used in similar syphilitic lesions elsewhere, but the object of such strong solutions is to destroy the diseased areas and promote healthy granulation-tissue. Now from the anatomical construction of the soft parts of the pharynx, the mucous surface not being backed up by dense muscular tissue, extensive loss of structure is necessarily followed by fibrous-tissue formation with marked subsequent contraction. The use, therefore, of solutions of sufficient strength to destroy tissue will not only involve the ulcerated area,

but the surrounding structure. Better results, then, will be obtained by thorough cleansing, mild local stimulation, and strict adherence to constitutional treatment, unless the ulceration involves the deeper structure, when the stronger solutions must be used to arrest the invasion. For the relief of the pain, especially during deglutition, a spray of—

℞. Menthol.,	gr. iv (0.25),
Camphoræ,	gr. ij (0.13),
Vaselini (liquid.),	ʒj (30.0).—M.

should be used by the patient, repeated before taking food, or at any other time when the symptoms demand its use. If the ulceration is deep and the pain severe, a 5 to 10 per cent. solution of cocaine should be used. Adhesions involving the soft palate, as well as other deformities produced by the fibrous contraction, which are most marked when following syphilitic ulceration, are now rarely if ever seen; the constitutional treatment having been instituted early in the disease prevents any such extensive local lesion.

Foreign Bodies.

The lodgment of foreign bodies in the pharynx is by no means an uncommon occurrence, and may be due to their size alone, or to both size and shape; spiculæ of bone and fish-bones being particularly liable to lodgment. The common sites are the lower portion of the pharynx, especially for the lodgment of large bodies, the postero-lateral walls involving the palatine fold, and the supra-epiglottic portion of the base of the tongue, which, while not pharynx proper, yet forms a portion of the anterior boundary. Any paralysis or loss of sensibility of the parts will tend to the lodgment of foreign bodies. Occasionally such conditions as follicular pharyngitis or lymphatic enlargement, or scratches produced by the accidental swallowing of such particles as a dry crust of bread, fish-bones, etc., may give rise to sensations and symptoms which simulate those produced by the actual presence of a foreign body and mislead both the patient and physician. To this may be added the imaginary foreign body described by hysterical patients.

The main point in the treatment is the location of the body, the removal after location not being usually attended with much difficulty. The irritation produced by the foreign body should be relieved by the application of an astringent such as tannin, 10 grains to the ounce, or a simple boric-acid wash, 5 to 10 grains to the ounce. This symptom is often so marked that it is difficult to persuade the patient that the foreign body has been actually removed. If much irritation and

laceration has been produced a balsam preparation will relieve by remaining in contact with the tissue for considerable time and forming a protective, as well as by its therapeutic action in exerting its astringent properties. The tincture of benzoin with 50 per cent. boroglyceride, equal parts, will give excellent results. As to the location of the foreign body, the patient should be directed to open the mouth, thus allowing all the parts to be relaxed, and inspection should be made without the use of the tongue-depressor or the laryngeal mirror. The advantage of such examination is that should the source of trouble be a fish-bone or spicule of bone or any small foreign body, the necessary muscular contraction produced by the resistance to the tongue-depressor will hide it in the palatine or faucial folds rendered tense by such contraction; whereas, if these are relaxed, the body will show plainly and can be easily removed. It must also be remembered that any violent contraction will serve to further imbed the foreign body. If from its continued presence there has been produced marked congestion, the location of the body will be still more difficult. If by direct inspection, however, the foreign body cannot be located, the pharyngeal mirror should be used, or, better, after spraying the parts with a 5 to 10 per cent. solution of cocaine, direct examination should be made with the index-finger. By a series of examinations the entire pharyngeal surface can be gone over and the foreign body located.

Foreign bodies in the pharynx are rarely of sufficient size to cause dangerous symptoms, or, if so, from their size permit of easy location and immediate removal; but if the circumstances should be such that immediate removal could not be accomplished and the patient's life be threatened, tracheotomy should be performed at once. If the foreign body be impacted low down in the pharynx involving the supraglottic region, thereby interfering with respiration, the patient should be placed on the table with the shoulders drawn to the edge and the head allowed to hang over. This will allow a direct inspection of the parts, and also aid in the removal of the foreign body, or at least by gravity will free the epiglottis from pressure by the body and lessen the danger of suffocation. Foreign bodies involving the lateral pharyngeal wall may not be imbedded in the tissue, but merely held by the spasm produced by their presence. In such cases relaxation may be produced by spraying the part with a strong solution of cocaine allowing the easy removal of the body without laceration of tissue. In a patient seen by the writer in which a pin was held by spastic contraction of the ary-epiglottic folds, its removal without injury to the parts was accomplished in this way. The patient should be placed in the position described above so that the body when freed will not enter the larynx, but by gravity drop into the buccal cavity.

DISEASES OF THE TONSILS.

Under this head we will treat only diseases occurring in the true tonsil. Of the acute inflammations there are many direct and associate causes. However, regardless of cause the acute inflammatory process of the tonsillar structure follows much the same course. If seen early, at the beginning of the inflammatory process, the tonsil should be touched with pure guaiacol, not only over the outer surface, but the crypts should be carefully mopped, being careful lest the guaiacol come in contact with the surrounding structure. This should not be repeated oftener than two or three times daily. Usually one or two applications suffice to abort the attack. If not effectual within twenty-four hours its local application should be discontinued. At the same time there should be given internally drachm-doses of the ammoniated tincture of guaiac in wine or milk and repeated every two hours for from four to six doses. While this treatment will usually give relief, should it fail, then instead of the ammoniated tincture of guaiac there should be substituted the tincture of the chloride of iron, 15 to 30 drops every three hours. The patient should be given at once a purgative, followed by a saline, and if from the character of the onset and symptoms a severe attack is anticipated, he should be put to bed and a 5- to 10-grain Dover's powder administered.

Should the inflammatory condition be well advanced before treatment is instituted, and if the tonsils are swollen and tense, causing difficulty in swallowing, the local treatment should consist in free bleeding by multiple punctures preferably by means of a sharp-pointed probe, as the puncture can be controlled and there is no danger of making too deep or too free an incision, nor of wounding the surrounding structures owing to a sudden movement of the patient. Hot applications externally seem to promote resolution.

The inflammatory process involving the tonsil may be primary, or secondary to peritonsillar inflammation. When secondary the process is in reality quinsy, or beginning peritonsillar abscess. The treatment of either condition is practically the same. There should be applied externally an ointment of ichthyol and lanolin, equal parts. This should be well rubbed in, as the rubbing in itself is beneficial in promoting resolution, and when combined with the action of the ichthyol is highly beneficial. Should the inflammatory process terminate by abscess-formation the pus should be evacuated at once.

When the tonsil is enlarged and of the soft spongy variety, or the tissue œdematous, it is often difficult to make a diagnosis, by inspection and palpation, of pus-formation. This may be done by puncturing the tonsil by means of an aspirating needle, and by suction

determining the absence or presence of pus. Multiple punctures may be made, for even if there is no pus present the free bleeding will be beneficial. The incision for evacuation of pus should be made in the long axis of the tonsil perpendicularly, as a transverse cut will upon healing necessarily form scar-tissue and by contraction may bind down the faucial pillars; while a longitudinal cut will not have such a tendency, or, if so, only to a limited degree. The cutting surface of the knife should be directed toward the faucial cavity, lessening the danger of wounding underlying blood-vessels and thereby avoiding dangerous hæmorrhage. By first puncturing with the needle the cutting of anomalous vessels may be avoided. Generally the pus-formation does not really occur within the tonsil proper, but within the peritonsillar tissue, necessitating a deep incision if it be made through the tonsil. The procedure is often attended with difficulty owing to the fact that the swollen tonsil makes it almost impossible for the patient to open his mouth.

Unquestionably a number of cases of simple tonsillitis are associated with, primarily or secondarily, a rheumatic diathesis. The clinical history of the case should aid in the diagnosis. The local treatment of such cases is the same as given above, but the internal treatment should consist in the administration of such drugs as will promote elimination through the kidneys and intestinal tract. Purgatives followed by salines will relieve the intestinal tract of any engorgement and the kidney may be stimulated by copious draughts of water and by the use of diuretics. This can be accomplished by the administration of Basham's mixture in from 1- to 4-drachm doses repeated every two hours for three or four doses, and then three or four times daily. The salicylates should be given in decided doses, preferably the salicylate of soda, 10 to 20 grains every three hours until three or four doses are given, followed by 5- to 10-grain doses three times daily. Should the salicylates not be well borne by the patient, salol should be substituted, in from 5- to 10-grain doses. There may be combined with the salol small doses of phenacetin, which will afford some amelioration of the pain and will also lessen the irritating effect of the salol on the mucous membranes of the stomach and intestines. The object of the administration of these drugs is to produce as rapidly as possible their complete physiological effect, the obtaining of such effect controlling the repetition and amount of dosage.

Occasionally in a mild attack of tonsillitis following a severe cold from exposure ulcerated areas may form on the tonsils. When this occurs the ulcerated surface should be thoroughly cleansed, dried, and touched with an astringent solution of sufficient strength to cause slight necrosis. This can be accomplished by the application of the

solid stick of nitrate of silver, care being taken not to touch the healthy tissue. After the slough forms, the granulating surface should be frequently cleansed by means of spray or gargle of an alkaline solution such as given on page 211. The process usually terminates by healing without further treatment than the careful and repeated cleansing.

Lacunar Tonsillitis.

This variety of tonsillitis is due entirely to mechanical irritation, produced by a collection of foreign material in the numerous crypts of the tonsil. These crypts vary in size and depth, as well as in location. In them will collect the foreign material, food, etc., which from decomposition and the presence of saprophytic bacteria produces marked irritation. This variety of tonsillitis usually has a history of irregularly repeated attacks without marked constitutional symptoms. The patient usually complains of a feeling of fulness in the throat with the sensation of a foreign body and of a decidedly disagreeable taste, which is easily explained by the decomposing material which has collected in the crypts of the tonsil. The treatment consists in freeing of the crypts of the caseous material. The crypts can usually be located by hard pressure on the tongue, forcing it well down, thus causing gagging on the part of the patient, the muscular contraction forcing the tonsil out and exposing the sebaceous material. This material should be pressed out by means of a strong probe, care being taken to examine the upper portion of the tonsil to see that none of the crypts are occluded by the palatine or faucial folds, causing the retention of the sebaceous material. The tonsils should be then carefully cleansed and after the acute inflammatory processes have subsided the crypts or sacs should be incised either by means of a curved bistoury or the galvano-cautery, the object being to do away with the sac and prevent further accumulation.

Enlarged Tonsils.

Under this heading we have really two conditions. As one variety there is the tonsil enlarged, firm, and dense, the so-called hypertrophied tonsil, which is in reality more of a hyperplasia; as the other, a soft, boggy, spongy tonsil containing very little connective-tissue element. It must be remembered in the treatment of either condition that the age of the patient and the amount of inconvenience or irritation produced by the enlarged tonsil must be considered. In children and young adults the tonsils are normally large, and unless they give rise to irritating symptoms and interference with phonation, require no treatment. This is equally true in advanced adult life. When the condition is such as to demand treatment, local

applications are of little use in the fibrous or so-called hypertrophic variety. The contour of the tonsil will determine somewhat the treatment. If the surface of the organ be regular, the removal of a small portion by means of the tonsillotome will, owing to the contraction produced by the scar-tissue which necessarily follows, sufficiently reduce its size, the object of this procedure being merely to relieve symptoms without necessitating the removal of the entire tonsil, as its presence is physiological. If the surface is irregular, nodular, and pedunculated, the various projections may be removed by means of the tonsil scissors or tonsillotome.

The after-treatment in either case consists in keeping the parts thoroughly clean by means of antiseptic alkaline solutions. This can be accomplished only to a limited degree, as it is impossible to render the tissues in this location thoroughly antiseptic. For this purpose a wash of biborate and bicarbonate of soda, of each 10 grains to the ounce of water, to which has been added a few drops of carbolic acid, is to be used. In the spongy or adenoid variety local applications are highly beneficial. The surface should be thoroughly cleansed and dried and the entire tonsillar tissue, as well as the crypts, carefully mopped with dilute hydrochloric acid. This treatment continued every other day, together with attention to the individual's general condition, will usually afford relief. There is in some cases, however, a tendency to a recurrence of the condition. If then the application of dilute hydrochloric only gives temporary relief, linear cauterization should be resorted to. The line of cauterization should be made in the long axis of the tonsil, thereby lessening the tendency to involvement of the faucial pillars.

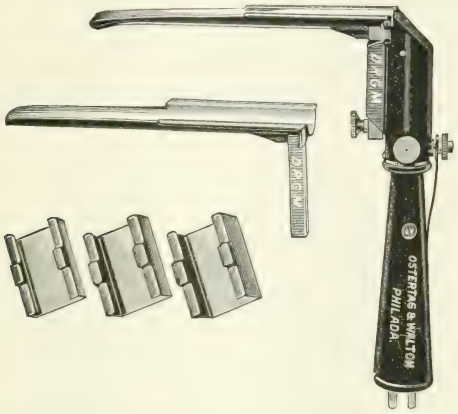
There are exceptional cases in which the tonsils are enormously enlarged, boggy, and filled with crypts presenting a ragged and discharging surface. In such cases a portion of the tonsil should be removed by means of the tonsillotome.

Occasionally cases are met with in which from some acute inflammatory process involving the tonsillar and peritonsillar tissue adhesions have taken place between the faucial pillars and the tonsil, producing, from the contraction which follows such adhesions, a sensation of constriction and discomfort in swallowing, with alteration in the voice. In such cases relief can be obtained by the breaking up of the adhesions and thoroughly freeing the tonsil, without necessitating the removal of the tonsillar tissue.

DISEASES OF THE LARYNX.

Autoscopy.—As supplementing the laryngoscope mirror in the examination of the larynx and trachea, we have the autoscope with the added claims of direct inspection and view of the posterior walls of these important structures. Kirstein of Berlin is the inventor and perfecter of this instrument, which consists of three parts: the spatula, the sliding hood, and the handle. The spatula is a slightly concave metal plate 14 cm. in length, which is in the main straight

FIG. 25.



but is slightly curved downward toward its laryngeal end, where it has a somewhat thickened lip and rounded edges to prevent injury to the parts with which it comes in contact. The sliding hood serves the purpose of keeping the teeth, the lips, and in man the mustache, away from the spatula, leaving sufficient space between the two plates for inspection and for the introduction of any instrument. The handle is the electroscope of Casper, which by means of its small electric light illuminates the entire length of the spatula and the parts beyond. (See Fig. 25.)

The two main conditions upon which the autoscope depends in laryngeal inspection are, first, that firm pressure upon the root of the tongue and the median glosso-epiglottic ligament will elevate the epiglottis, thus giving the desired view; and, second, that by proper position the laryngo-tracheal tube may be made to form a straight instead of an angular line with the axis of the buccal cavity.

The technique of examination is as follows: The physician stands

before the patient, who is seated in a chair with the neck slightly inclined forward. The autoscope is introduced in exactly the same manner as applying an ordinary tongue-depressor. A view of the buccal cavity and oro-pharynx is thus obtained. By pushing the spatula farther backward, elevating the handle, and pressing firmly downward and backward on the base of the tongue, being careful not to use the upper teeth as a fulcrum, the lower part of the pharynx, the larynx, and if the patient's position be correct the trachea, may be seen. The actual tissues appear in autoscopy, not their image, with a remarkable distinctness of anatomical detail. Above all, the posterior wall of the larynx, the interarytenoid fold, which can be examined only with great difficulty by the aid of the mirror, can be inspected almost in a surface view; and the possibility of inspecting the whole of the trachea and the beginning of the bronchi should alone be sufficient to ensure for autoscopy recognition among diagnostic resources.

Acute Laryngitis.

An acute inflammatory process involving the mucous membrane of the larynx is not always a serious condition, yet, from its location and the tendency to œdema with the subsequent interference to respiration, the condition always demands prompt and energetic treatment. By the use of the laryngoscope the area of inflammation can be outlined and its severity determined. If seen early and the process is limited, with no threatened œdema, such remedial agents should be used as will relax peripheral vessels, thereby diminishing local pressure. For this purpose there should be administered internally every hour for three or four doses an effervescing pilocarpine tablet containing $\frac{1}{100}$ grain of the drug. Hot mustard foot-baths should be given, followed by hot drinks, such as hot lemonade, to promote diaphoresis. Attention should be given to the condition of the intestinal tract, and although there is no existing constipation a gentle purgative is beneficial from its general derivative action. This plan of treatment in a majority of cases will relieve the congestion and rapidly promote resolution. If the tissue surrounding the cords be involved in the inflammatory process inhalations of the compound tincture of benzoin, a teaspoonful to a half-pint of boiling water, are useful. If there is marked irritation there may be added to the benzoin a teaspoonful of paregoric. Equally good is the local application by means of spray or nebulizer of some bland oil, as liquid vaseline or albolene, one ounce, to which is added from 4 to 6 drops of oil of sandalwood and one to three drops of oil of tar. If the inflammatory process be in the early stage and the patient's occupation demands the constant use of the voice, relief can be given in a few hours by the administration

of 5 to 10 drops of dilute nitric acid in water or on a lump of sugar, repeated first every half-hour, then every hour, for two or three doses. From its action on the arterioles and relief of the congestion, thereby depleting the part, the condition may be relieved and the voice restored. If this treatment is used in the evening, the morning will usually show a return of the condition, unless the irritation be very much localized, when there is more hope of a permanent recovery.

With regard to the local application of cocaine which is so frequently recommended, while it is unquestionably of value in causing depletion and relieving irritation, yet the local effect is of short duration, thereby necessitating its frequent repetition; the tendency, moreover, to recurrence of the congestion which commonly follows its application renders its use questionable.

The use of external applications affords very little relief. However, early in the inflammatory process the external application of cold by means of the ordinary ice- or cold-water bag may afford some relief. This should be used only early in the case, and should not be applied longer than a few moments at a time, repeated application for a short period affording more relief than the continued application. The insufflation of powders is highly objectionable, as the irritation produced by such agents increases the condition that is sought to be relieved. In the stage of exudation, when there is profuse secretion, before applying the oily solution as recommended above the parts may be sprayed by a simple cleansing alkaline wash such as biborate or bicarbonate of sodium, 10 to 15 grains to the ounce of tepid water. Very little of such application will come in contact with the laryngeal tissue, but it serves to clean away the mucus surrounding the epiglottis and low down in the pharynx.

When there is existing œdema which involves the glottis and laryngeal structure, prompt surgical interference is necessary. The œdematous tissue must be punctured. The puncturing is better than scarifying, as there is less danger of causing any serious hæmorrhage and there is also less laceration of tissue. It must be remembered that in œdema the engorgement is not a vascular one, but a watery infiltration of the perivascular structures, and that such exudation somewhat relieves the engorged vessels. Puncturing, then, will relieve this watery infiltration, while scarifying will accomplish the same result but with the added evil of more extensive laceration. This procedure may be followed by the application of mild astringents such as liquor ferri persulphatis, 5 to 10 drops to the ounce, or argenti nitras, 2 to 5 grains to the ounce.

If the œdema be rapid and well advanced and the danger of suffocation imminent, immediate intubation or tracheotomy is indicated.

There is a tendency after the subsidence of the acute attack to

huskiness or even complete loss of the voice, lasting for several days or weeks. For the relief of such a condition there should be administered internally 5-grain doses of the benzoate of sodium. At the same time there should be used locally mild astringents such as tannin or alum, 5 to 10 grains to the ounce of water, in spray.

General medication is not usually indicated in acute laryngitis, although there may be associated conditions necessitating special attention. For the distressing irritating cough there may be administered an anodyne, as codeine sulphate in doses of gr. $\frac{1}{2}$ to $\frac{1}{8}$, repeated only to the point of relief of the symptom. In individuals of a rheumatic or gouty tendency an alkali should be given. In such cases a 5-grain effervescing citrate of lithium tablet every three hours in half a glass of water, or preferably the carbonate of lithium in the same dose, should be given. If the vocal bands are markedly involved in the inflammatory process, causing complete loss of voice, absolute rest should be insisted upon.

Acute Laryngitis in Children.

Simple acute laryngitis rarely ever occurs in children, the acute inflammatory process either being classed under the spasmodic condition known as spasmodic croup or under the membranous variety of inflammation. While all membranous inflammatory processes are not true diphtheria, yet the symptoms produced by the actual membrane, as well as the early treatment of the case, is precisely the same as in true diphtheria. For the membranous conditions, then, the reader is referred to the article on Diphtheria.

Acute Laryngitis or Spasmodic Croup.—While the anatomical relations of the structure of the larynx in children do not differ materially from those found in the adult, yet the measurements or dimensions are smaller, and there also exists a vascularity of the mucous membrane lining the larynx which is peculiar to children. Any condition bringing about sudden congestion, associated with the narrowness of the rima, will give rise to alarming and distressing symptoms. It must also be remembered that in children reflex excitability is more marked than in adults. That sudden atmospheric changes with exposure to cold and dampness is one of the important exciting etiological factors is borne out by the fact that the condition is most likely to occur in the spring and fall months. Beside these the irritation produced by the inhalation of irritating vapors, fumes, or dust, or an associated gastro-intestinal irritation, may be exciting factors. The condition is sudden in onset, rapid in course, and terminates as rapidly as it began.

As this condition presents no premonitory symptoms, the child usually waking at night with a fully developed case of spasmodic

croup, the treatment should be first directed to the relief of the actual spasm itself, and after this has been relieved the underlying causes should be investigated. Should there be much secretion present and accumulation in the larynx an emetic should be at once given, such as ipecac in the form of the wine or syrup, in a dose determined by the age of the child and the urgency of the symptoms. Prompt emesis can be obtained by the hypodermic administration of apomorphine, but it should only be employed in extreme cases because of its depressing effects. In cases in which there is very little accumulation of fluid within the larynx and yet spasm is brought about reflexly by gastric irritation, an emetic is also useful as a remedial agent. The continued hot bath and the use of hot vapors are successful measures in promoting relaxation and free diaphoresis, and should always be employed. After the relief of the paroxysm attention should be directed toward the exciting factor and treatment directed against its return. Any gastro-intestinal irritation should be corrected, and the child should be kept in an equable temperature and care should be taken that the air of the room be of the proper humidity and that it be free from any irritating fumes such as are generated by improperly regulated heaters or the ordinary coal-stove.

Subacute Laryngitis.

This condition is usually secondary to the acute. The conditions vary much in individual cases and the successful treatment will depend on a thorough knowledge and close study of the causes underlying each case. The thickened inflammatory condition involves the submucosa with infiltration into the perivascular structure. This condition continued produces perverted secretion with annoying dryness and distressing hoarseness. Should there be any irritating or exciting causes, such as smoking, inhalations of dust, etc., the removal of these exciting factors is the first thing to be done in the treatment of the case. The local application should consist of an alkaline spray, which should be as hot as can be comfortably borne by the patient. Warm boric-acid solution, 5 to 15 grains to the ounce, is highly beneficial, although the benefit derived by the application of the warm water alone is to my mind quite as great as when the acid has been added. This should be repeated six to eight times daily, but if the condition exists in an individual whose profession necessitates the use of the voice, the warm spray should not be used within three or four hours of the time of the continued employment of the voice. As far as possible, though, in individuals suffering from this condition, rest of the vocal bands—at least from any continued effort—should be insisted upon.

In individuals in whom the dryness is due to a deficiency of secretion the internal administration of drugs which increase secretion will

produce the best results. However, it must be carefully ascertained that there is no lesion elsewhere which is the direct cause of the laryngeal complication. For example, such conditions as valvular heart disease or fibroid lung, or any lesion of the circulation with a tendency to cyanosis of the mucous membrane, will bring about just such a condition of dryness in the larynx. If such condition exist, local or internal medication directed to the laryngeal structure alone will be of little value. For the increase of secretion in such cases as are not dependent on the causes mentioned above there should be administered internally, every three hours, 5-grain doses of the benzoate of ammonium to be given in half a glass of water; its irritating effect on the mucous membrane of the stomach can be avoided by discontinuing its use every third day. In cases where the drug is to be used for a long time this omitting of the dose every third day should be part of the directions for its use. If the condition is well advanced and bordering on a chronic laryngitis, better results will be obtained by the administration three times daily of 5 grains each of iodide of sodium and potassium, observing the same precaution as advised in the use of the ammonium salt.

In the subacute variety following a catarrhal process, in which the hoarseness in speaking is produced by the accumulation of secretion about the vocal bands and within the larynx, the best results will be obtained by the internal administration of 1- to 3-grain doses of carbonate of guaiacol in pill form in plenty of water. This seems to relieve the condition by thinning the viscid secretion and by its stimulating action on the muciparous glands and circulation. By such action the parts are relieved of the irritating secretion, and normal circulation and secretion are established. In cases in which the secretion is exceedingly tenacious, before the guaiacol is given or in combination with it there should be administered terpene hydrate in 5- to 15-grain doses; any irritating effect of this drug on the mucous membrane of the stomach can be avoided by giving it in a large amount of water. This should be taken every three hours until there is marked effect on the secretion, and then two or three times daily. Should this excess of secretion, although of a fairly normal character, be continued the administration of the above drugs should be discontinued and there should be given three or four times daily gr. $\frac{1}{24}$ of morphine, or, better, gr. $\frac{1}{12}$ of codeine.

In all cases of laryngitis, either acute, subacute, or chronic, attention should be devoted to the gastro-intestinal tract, and such conditions as tend to cause deficiency in glandular secretion and venous stasis should be relieved. One of the best agents for the depletion of the intestinal circulation and for its derivative action on laryngeal structures is sulphate of magnesium in large doses. It must be

remembered that frequently acute or subacute laryngitis is caused by the spreading of the inflammatory process by contiguity and continuity from some neighboring structure or part, as from the pharynx, œsophagus, tonsils, and naso-pharynx. In such cases the active treatment should be directed toward the offending structure as well as the medication of the larynx itself.

Inhalations if properly administered are of some benefit. A teaspoonful of the tincture of benzoin placed in a cup of boiling water and the medicated steam inhaled just before retiring will often relieve the distressing cough and irritation so often increased when the recumbent position is assumed. Inhalations should not be used, however, except when the individual is confined to his room or just before retiring, as otherwise there is danger of catching cold.

Local applications made directly to the larynx are of questionable value; for the laryngeal structure is physiologically opposed to and anatomically protected from the entrance of foreign bodies. The introduction of the applicator is practically that of a foreign body, and the irritation produced by the immediate application of remedial agents to the sensitive laryngeal structures will more than counterbalance the beneficial effect aimed at.

Chronic Laryngitis.

Of the chronic inflammatory processes involving the laryngeal structures in addition to the chronic specific inflammations there are two principal ones: first, simple chronic laryngitis; secondly, dry laryngitis or laryngitis sicca.

Simple Chronic Laryngitis.—Simple chronic laryngitis may be secondary to an acute condition of the larynx, but the process is usually secondary to or associated with lesions of the respiratory tract above the larynx, and the treatment should be primarily at least directed to the relief of the existing lesions rather than directly to larynx itself. In all catarrhal conditions of the nose, naso-pharynx, and pharynx, with the consequent accumulation and irritation produced by such accumulation there must necessarily be produced continued irritation of the laryngeal structure. Repeated and thorough cleansing of such affected parts should be strictly enforced. For its cleansing and detergent effect bicarbonate of potassium and bicarbonate of sodium, of each 10 to 15 grains to the ounce of warm water, three or four times daily, as a douche or by means of a spray, should be used.

For the treatment of the catarrhal condition after cleansing there should be applied directly to the structures a mild astringent. For this purpose a solution of sulphate of copper or nitrate of silver, 5 to 10 grains to the ounce, may be employed and intra-laryngeal

applications made. When applied by means of cotton, care should be taken that no excess of the solution be used, as the pressure employed in the application may cause the solution to run over healthy structures and down into the trachea. Equally good results will be obtained by the application by means of a spray of a 3 per cent. solution of alumnol; although a comparatively new drug, I have found it highly beneficial in such conditions. The employment of astringents is often overdone, and applications should not be made oftener than once daily.

Besides the correction of any nasal irregularities, attention must be given to the individual's personal habits as regards the use of tobacco and alcohol. As climate and occupation may have to do with the case as etiological factors, temporary or possibly permanent change from such exposure should be insisted upon. It must be remembered that the condition may be dependent upon or aggravated by gastro-intestinal, hepatic, and even renal lesions. In such cases treatment should be directed toward the offending organ. If the general health is at fault, constitutional treatment should be instituted. Of the therapeutic agents administered for the direct effect on the mucous membrane, if the secretions are profuse yet tenacious, benzoate of sodium three or four times daily in 5-grain doses is the best. If the secretions are scanty and there is a tendency to dryness of the membrane, iodine gr. $\frac{1}{8}$, phosphorus gr. $\frac{1}{100}$, bromine gr. $\frac{1}{8}$, in sherry wine (compound wine of iodine), in plenty of water three times daily, is useful.

Dry Laryngitis or Laryngitis Sicca.—Dry laryngitis is always a chronic condition in which there is not only a deficiency of secretion, but the secretion present is not of a normal character and there is a marked tendency to the rapid coagulation or drying of this material on the surface of the mucous membrane. While the condition is analogous to atrophic rhinitis, yet it is questionable if it is dependent upon or other than accidentally associated with it. Whether it be brought about by a chronic inflammatory process with involvement of the submucosa, with connective-tissue proliferation and new tissue formation and subsequent contraction, or whether it be primarily some atrophic process involving the mucous membrane, it matters little, as either condition would bring about interference with the function of the muciparous glands normally located in the laryngeal structure. Personally I do not believe that the atrophic process is brought about by any one particular condition, but that it may be produced by a number of pathological alterations. For example, in a cyanotic condition with continued pressure caused by engorged vessels, with the necessary entanglement of the muciparous glands, the same condition would be produced as when the gland-structure is involved and the contracting tissue is the result of a chronic inflammatory process.

The treatment of this troublesome condition should be directed first toward the removal of the associated lesions. The general health of the individual must, then, be carefully looked into and tonic agents should be administered, as the general condition of the patient indicates. Abnormalities in the nasal cavities and naso-pharynx should be corrected. For the relief of the irritation caused by the accumulation of the dried material within the laryngeal structures direct medication is necessitated. There should be applied directly to the surface, by means of spray or applicator, a dissolving, cleansing alkaline solution such as already recommended. The irritation of the membrane by the introduction of the applicator will be productive of no harmful results; in this condition a slight irritation is really beneficial. After the removal of the inspissated mucus the parts should be lubricated with a bland oily solution such as liquid albolene or benzoinol to which has been added six drops of the oil of sandalwood to the ounce. This solution applied at intervals of three or four hours will relieve the patient of the distressing symptoms produced by the drying of the secretion.

As to internal administration, the phosphorus, iodine, and bromine combination mentioned on page 228 is very beneficial. However, if the condition is well advanced and permanent alterations have been produced in the mucous membrane, nothing but palliation will be accomplished, as a permanent cure cannot be effected.

Œdema of the Larynx.

Œdema of the larynx may be produced in a number of ways. It may be associated with an acute laryngitis, may be a result of inflammatory processes involving the pharyngeal, tonsillar, or peritonsillar structure, or may be produced suddenly by the inhalation of acrid vapors or irritating fumes. Such processes will produce an acute condition, yet it must be remembered that chronic specific inflammations also may bring about a sudden œdema of the larynx—as, for example, in syphilis and tuberculosis, in which the blood-vessels are involved and there is an œdematous infiltration of the adjacent structures. This is also true in malignant diseases of the larynx. The irritation caused by foreign bodies not within the larynx, but in the œsophagus or the pharyngeal structure, may produce a sudden œdema of the larynx. The treatment should first be directed toward the relief of the œdema, whether it be due to an acute phlegmonous inflammation, passive congestion, irritation from foreign bodies, or irritating vapors, and then the curative treatment or the treatment to prevent its recurrence should be addressed to the underlying cause.

Besides the irritation caused by disease processes in the structures

immediately adjacent, it must be remembered that œdema of the larynx may be caused by cardiac and pulmonary conditions producing cyanosis of the mucous membrane, also that renal and hepatic lesions, especially the fibrous changes, through their action on the heart, may bring about the same condition. In all such cases the constitutional treatment should be directed toward the offending structure, to prevent, if possible, a recurrent attack.

For the immediate relief of the œdema puncturing or scarifying should be done at once; the patient should be given a saline cathartic and kept in a warm room in an atmosphere thoroughly surcharged with moisture, and a diaphoretic administered. The punctures and scarifying should be done under the same rules as mentioned under Acute Laryngitis with subsequent œdema. The application of astringents after puncturing are rarely necessary if the above method has been carried out. However, should it be necessary to apply astringents, 10 grains to the ounce of nitrate of silver, or a 10 per cent. alumnol solution, should be used. As a rule, if the puncturing be followed by the application of a 20 to 30 per cent. aqueous solution of ichthyol, the tendency to recurrence is markedly diminished, as the ichthyol promotes rapid resolution. In all cases of œdema associated with renal, cardiac, or hepatic disorders free daily movements of the bowels must be secured until the condition is relieved. The application of cold in the form of ice-bag, or Leiter's coils, or the application of leeches may be of service in arresting further œdema, as the effect produced by such procedure is largely limited to the blood-vessel itself, while the condition to be relieved is entirely a perivascular one and consists of a watery infiltration of the structures involved. Such procedure then would be of service only by toning up the vessel-walls and in this way preventing further leakage, but would not affect the serum already poured out into the perivascular tissue.

In cases of sudden œdema which are usually associated with acute suppurative processes, it may be so sudden and rapid that the patient is in danger of suffocation. In these instances intubation or tracheotomy should be performed at once. Tracheotomy is preferable to laryngotomy only because the opening in the air-passages is at a point away from the inflammatory process. In œdema of the larynx associated with syphilitic lesions it must be remembered that the administration of the iodide of potassium, while not actually producing the condition, tends to complicate and aggravate it and should be discontinued.

Œdema may be associated with either perichondritis or chondritis as causative factors, and when the diagnosis is assured the treatment should consist, early in the condition, first, in the application

of the aqueous solution of ichthyol internally, externally an ointment of ichthyol and lanolin equal parts. Should the œdema be threatening and require immediate relief it will be necessary to resort to scarification and puncture. Involvement of the cartilage or pericartilaginous structures is rarely associated with simple acute inflammatory processes, but usually with infectious diseases, frequently following typhoid fever.

Specific Inflammations.

Under the specific inflammations the varieties which we commonly have to deal with in the laryngeal structure are syphilis and tuberculosis, although glanders may also occur.

Glanders of the Larynx.—This is a rare condition and is never limited to the laryngeal structure, and when such involvement takes place it is in the chronic form. One case was seen by the writer in which this condition involved not only the pharyngeal and nasopharyngeal but also the laryngeal structure. The diagnosis of such a condition can be established by bacteriological investigation, and unless made early complete removal is almost impossible. Outside of surgical interference the administration of iodide of potassium pushed to its physiological limit will be of benefit. The treatment with melanin may be productive of good results, but not sufficient experience has been reported to warrant its recommendation as a curative measure.

Tuberculosis of the Larynx.—Tuberculosis of the larynx usually occurs secondary to pulmonary tuberculosis, although primary involvement of this part may occur. The treatment in either case is the same, although the prognosis in the primary condition is more favorable than when dependent upon pulmonary lesion. Much can be done by regular systematic local treatment to retard the progress of the disease, and possibly in some cases a cure may be effected. As a rule, the condition when presented for treatment has advanced to ulceration. Repeated and thorough cleansing of the part should be instituted at once. This can best be accomplished by spraying the parts with hydrogen peroxide (15-volume), followed by an alkaline antiseptic solution such as biborate and bicarbonate of sodium, of each 10 grains to the ounce of cinnamon-water and distilled water equal parts. After cleansing and drying, the ulcerated surface should be carefully touched with dilute nitric or hydrochloric acid. The frequency of such applications must be left to the judgment of the physician based on his knowledge of the case, but as a rule once daily is sufficient. If the ulcer is deep, curettement under cocaine or eucaine anæsthesia should be done. The curettement should be thorough, as it must be remembered that the tubercular area is sur-

rounded by a limiting membrane, and unless the infected tissue be thoroughly removed the breaking up of the protecting membrane may be the means of rapid dissemination of the tuberculous infection through the lymphatics or blood-channels. In cases in which the ulceration is not far advanced, or the process is somewhat limited, after the cleansing and drying of the surface there should be applied directly to the ulcerated area, either by means of spray or applicator—

R. Creasoti,	ʒj (4.0);
Olei picis liquidæ,	gtt. xx (1.3);
Alboleni (liquid.),	f ʒss (15.0)—M.

Castor oil may be substituted for the albolene on account of its viscid and tenacious properties, but I find it productive of no better results.

The most distressing symptom experienced by the patient is the constant pain, which is especially aggravated by swallowing. A number of agents are recommended for the relief of this condition, no single remedy being efficacious in all cases. The simplest and the one from which I have obtained the best results is the juice of the ordinary pineapple applied by means of spray or applicator. This can be frequently repeated without any ill effects. Cocaine in a 6 to 10 per cent. solution as a spray will give relief, but it is not lasting and requires frequent repetition. Inhalation of benzoin gives partial relief. Should there be dryness of the parts, a solution of—

R. Menthol,	gr. iv (0.25);
Olei santali,	gtt. iv (0.25);
Alboleni (vel benzoinol),	f ʒj (30.0).—M.

will lubricate the surface and relieve the irritation. Cracked ice acts favorably and gives some temporary relief. Liquid diet should be instituted and no irritating condiments used. In the advanced stage of the disease in which the treatment is purely palliative, narcotics may have to be administered to relieve the intense suffering.

The constitutional treatment should consist in the administration of such drugs as will improve the general nutrition, as cod-liver oil, iron, hypophosphites, or the arsenical preparations, and if the tubercular tendency be recognized early, the patient should be placed under suitable climatic conditions.

Syphilis of the Larynx.—Under this heading is included all conditions brought about by the inoculation of the specific virus either hereditary or acquired. The diseased condition of the larynx is usually manifested in the secondary or tertiary form. Primary lesions

rarely, if ever, occur in the laryngeal structure. The laryngitis of secondary syphilis presents very little that is characteristic, the common lesion being the tertiary one. The primary lesion presents no indication for treatment; the better rule is to follow the well-established practice of waiting for secondary manifestations. The mucous patch which occurs in the larynx is usually limited and single and yields promptly to internal medication. If, however, local treatment should be indicated the lesion is treated exactly as a mucous patch elsewhere. In the superficial ulcer the parts should be thoroughly cleansed, following the same method as given under tuberculous lesion of the larynx, and then touched with 20 to 40 grains of nitrate of silver to the ounce of water. Good results may be obtained, when the ulcer is accompanied by an acute inflammatory process involving the surrounding tissue, by insufflation, after thorough cleansing, of pyoktanin (1 to 2 drachms to the ounce of stearate of zinc). The objection to the use of powders is the danger of drawing the powder farther into the respiratory tract and producing irritation. This can be obviated by the patient taking a deep inspiration and holding the breath during the insufflation. By so doing the first respiratory act after the application will be one of expiration.

In the deep ulceration due to gummatous degeneration the same course of local procedure as followed in the secondary lesions should be observed. In the secondary and tertiary stages, while the local treatment is of importance, yet the internal medication is the prime factor, and the system must as soon as possible be brought completely under anti-syphilitic influence. In the second stage the mixed treatment is to be used; the iodide of potassium alone in the tertiary lesion. The plans for such treatment are too well known to necessitate repetition. (See article on Syphilis.)

Much has been written in regard to the treatment of syphilitic stenosis due to fibrous-tissue formation after ulceration. This should not occur if, upon early recognition of the lesion, proper, prompt, and energetic anti-syphilitic treatment has been instituted, and it is only in neglected or exceptional cases that such lesions exist. Once fibrous-tissue formation has taken place no amount of internal medication will benefit it. The resulting cicatricial tissue presents the well-known stellate scar with the peculiar contraction and alteration of the contour of the part. The division of the stellate bands may relieve somewhat the condition, but the incision that divides the bands brings about another inflammation with its subsequent contraction. Various dilators are recommended, and no doubt produce some beneficial results, but it must be remembered that we are dealing with an inflammatory fibrous tissue, and while dilatation may retard and somewhat arrest the contraction it cannot entirely remove the stenosis.

The contraction may go on to such an extent as to necessitate, in order to prolong the patient's life, the performing of tracheotomy.

Tumors of the Larynx.

Owing to the histological structure of the larynx it is possible to have occurring there any variety of tumor, either adult or embryonic, of either type of tissue—epithelial or connective. The benign or adult tumors occurring within the larynx or involving the vocal bands are always of grave import, not only from the irritation produced by the presence of such a tumor—which in itself acts very much the same as that of a foreign body, interfering with phonation and respiration, such interference depending upon the size and location of the tumor—but also from their tendency to malignant change. It is a well-known clinical fact that benign neoplasms which are subject to chronic irritation or trauma may become the site of malignant growths. This does not mean that the benign growth is by some unexplainable process transformed into a malignant one, but that the former is the site of the malignant development just as any other adult structure may be the site of such development. Of the adult tumors occurring within the larynx or involving the cords the papilloma is possibly the most frequent. This is an adult epithelial neoplasm, and contains both connective and epithelial types of tissue. From the chronic irritation, then, this simple benign tumor may be transformed into a malignant or carcinomatous growth. Of the adult connective-tissue tumors likely to occur in this location the simple myxoma or the fibro-myxoma are the most common.

The attempt at removal of such tumors by the application of acids or other irritants may bring about malignant change. As by trauma, and the application of such solutions as chromic acid, or the galvanocautery which practically amounts to trauma, this benign connective-tissue tumor may become the site of a malignant or embryonic connective-tissue growth—sarcoma. The treatment, then, of benign tumors involving the laryngeal structure should be their prompt removal through surgical interference, either by cutting forceps, cold snare, or especially curved scissors, care being taken to produce as little laceration of the healthy structure as possible and yet obtain the complete removal of the growth. Malignant growths will necessitate a major operation such as the removal of a portion or the entire laryngeal structure. This has been successfully done, and the individuals were for a time at least freed from any manifestation of the growth. At the same time, owing to the rich lymphatic supply, there is quite likely to be a return of the tumor, or rather, often, a failure of complete removal. As all varieties of the carcinoma spread by the lymphatics, no fixed or definite line can be drawn as to limit of the inva-

sion. Sarcoma occurring in this region is equally liable to dissemination, although through the blood-channels and not by the lymphatics. In either case with the invasion of the surrounding structure its complete removal would necessarily involve the important and vital structures of this region. Partial removal, then, may afford some temporary relief, but a permanent cure cannot be expected.

Foreign Bodies in the Larynx.

The introduction into the larynx or the trachea of a foreign body is an accident at once alarming and at the same time exceptionally dangerous to life. Foreign bodies interfere with respiration in several ways: first, by size; second, by size and shape combined; third, by their composition—for certain substances, as wood, cork, grains of corn, etc., owing to the absorption of moisture increase in size after introduction, thus causing obstruction and increasing the tendency to œdema, either in the larynx primarily, or secondarily from adjacent structures or the œsophagus by being lodged in those structures. The commonest mode of entrance is through the mouth during ill-timed or forcible inspiration, either while laughing, eating, or upon being suddenly startled or frightened. Whether the body be caught in the larynx or swept immediately and directly into the trachea or bronchi depends upon its size and shape. Large and irregularly shaped articles being unable to pass through, are caught and held in some part of the larynx.

The history of the case often leaves no room for doubt as to diagnosis. But should any exist, the direct inspection by the use of the laryngeal mirror (after overcoming spasm, if it exist, by a 10 per cent. cocaine solution), digital examination, or auscultation will soon reveal the location of the offending article.

Another and recent method of determining the exact position of the foreign body encysted or free in the upper respiratory tract is the discovery of Professor Roentgen. Not only photography using the Roentgen rays, but also the cryptoscope with the fluorescent screen has proved eminently satisfactory, not only in the locating of foreign bodies, but also in determining alteration in the bony and cartilaginous structure such as necrosis of bone and ossification in the cartilages. The transparency to the rays of the cartilaginous matter of the larynx, however, renders it necessary to draw up a projected chart of this region for the localizing with exactitude of the actual position of the foreign body. The pain due to a foreign body is often referred to a point other than its actual location. By determining its exact position by the *x*-rays, the false data of this misleading symptom can be at once set aside.

In a number of cases the foreign body has been spontaneously

expelled through the mouth; should this not occur, however, an effort should be made at once to extract it through the natural passages. The special means and instruments to be employed to accomplish this end differ with each case, but the position to be assumed by the patient while the effort is made to extract the foreign body is identical in all cases. He should lie on his back on a table with the shoulders at the edge, the head hanging over, with the mouth wide open. By the adoption of this position—1. The physician is enabled to examine the patient with at least as much ease as in any other posture, with the added value of better control of his movements; 2. Respiration is not interfered with; 3. The foreign body if it be detached, whether by efforts of the examiner or spontaneously, cannot drop farther into the respiratory tract, but must of necessity fall into the mouth.

Sternutatories, emetics, and the like may be of value and should be administered. Should necessity require it, the respiratory tract should be opened in the position most favorable for the removal of the body. Intubation if attempted should be done with exceeding caution, as there is great danger of further imbedding or pushing the body down into the bronchi. Usually the symptoms produced are so sudden and of such a threatening nature as to demand immediate relief, so that often the many convenient and useful instruments devised for the removal of foreign bodies are not at hand. The multiplicity of instruments devised proves that no single one is applicable in all cases. A simple improvised instrument is the wire loop, using several loops and passing them well down into the larynx, and by twisting the wires on removal the foreign body may become entangled in the coils.

The foreign body may be impacted and retained by muscular spasm, especially if above the true bands. If the patient be placed in the position given above and the parts sprayed with a 20 per cent. solution of cocaine, relaxation may be accomplished and the body drop out by gravity. Smooth and metallic bodies may be expelled by inversion of the patient.

NEW FACTS AND METHODS IN THE TREATMENT OF DIPHTHERIA.

By WILLIAM HALLOCK PARK, M. D.

In the treatment of diphtheria we have at last a specific remedy. I believe it is no exaggeration to say that in *diphtheria antitoxin* we have a remedy superior to all other remedies combined. It has both immunizing and curative properties, and in no wise interferes with other treatment.

Through our investigations upon the pathology and bacteriology of diphtheria we have gained more correct views upon local and general treatment. By means of cultures we can determine the presence or absence of diphtheria bacilli in the throats of convalescent patients and also of those who have been in contact with the sick. We are thus able to shorten or lengthen the isolation of each case according to its individual need.

In *anti-streptococcus* serum we have an attempt to combat the invasion of the streptococci, so that we may not only be able to cure cases of pure diphtheria, but those in which the lesions are due to mixed infection. This serum is as yet very weak in curative power, but it may at any time become sufficiently improved to have practical value.

No new drugs or methods of operation have been brought forward that seem to me to possess any value superior to those already long in use.

Diphtheria Antitoxin.

Origin.—Experiments have shown that the blood of persons who have recovered from an attack of diphtheria contains a substance which is an antidote to the poison produced by the diphtheria bacillus. It has also been shown that the blood of animals which have received repeated injections of the diphtheria toxin contains this same curative or antitoxic substance, and in even greater amounts. At the present time horses are universally used to obtain this serum. Healthy young horses are injected subcutaneously for several months with ever-increasing doses of the diphtheria toxin. After periods varying in different horses

the blood is found to contain sufficient antitoxin to be used for purposes of treatment. The blood is drawn aseptically by tapping the jugular vein and collecting it in large sterilized flasks. Here it is allowed to clot and the serum to separate. The latter is drawn off under aseptic precautions and bottled for use, preservative such as a little camphor or carbolic acid being added. The serum is tested upon guinea-pigs and is measured in antitoxin units. An antitoxin unit is an amount of antitoxin sufficient to save the life of a guinea-pig from an injection ten times the fatal dose of diphtheria toxin, the two being injected together.

At first serum was used which contained but 50 to 100 antitoxin units in each cubic centimetre, but now much stronger serums have been obtained, and it is better to employ one containing at least 200 units in each c.cm., and, better still, one containing 500 units.

Curative and Immunizing Value of Antitoxin in Animals.—As guinea-pigs and other animals are very susceptible to diphtheria, our observation of the effects of antitoxin in them has been of great practical value. A dose of antitoxin given to animals before or at the same time as a dose of diphtheria toxin or of the living diphtheria bacilli will always and invariably prevent the poisonous effects of the toxin or bacilli.

If the inoculation with the antitoxin follows within a short time that of the poison or living germs, it will in greater amounts still prove curative, but if the antitoxin is withheld until the animal is under profound constitutional poisoning, the antitoxin without regard to dose will prove valueless. The above facts have proven to be universally true in countless experiments, and in the strongest way indicate the danger of delay in using antitoxin. The cells seem capable of being affected by but one of the two substances. If healthy, the antitoxin so alters them that the toxin is powerless to exert its otherwise deleterious effects, while if injured materially by the toxin, the antitoxin can no longer exert its protective influence, the lesions advancing in spite of it.

In animals also it has been shown that a definite amount of antitoxin is required to neutralize a definite amount of toxin. If the toxin is doubled, the antitoxin must also be doubled. It has also been shown that a sufficient amount is as good as an excess.

Use of Antitoxin in Human Beings both in Treatment and as an Immunizing Agent.—To the teachings of animal experimentation we have now added the experience gained from the treatment of many thousands of cases, over 50,000 having already been recorded.

Although I believe that the curative value of diphtheria antitoxin is absolutely established, yet because its use is so recent, and also

because it has still a few opponents, I shall give not only my personal views and experience, but also that of others.

Before doing this it will be well to consider briefly a few facts concerning diphtheria and diphtheria antitoxin, a correct understanding of which is absolutely essential to our forming a true estimate of the curative serum.

Diphtheria starts as a local lesion, and the toxin is produced by the bacilli at the site of the membrane; as the epithelium becomes necrotic absorption takes place and general constitutional symptoms and lesions develop. In some cases the absorption is very rapid, in others it is slow. The amount absorbed also varies. The hour and day upon which the absorbed poison has produced such an effect upon the cells of the body as to prevent antitoxin producing its immunizing effect must vary in every case. In stating that a case was injected upon the first or second or any other given day, we therefore only in the roughest manner indicate the condition of the patient.

The local lesions in diphtheria indicate only in a general way the amount of poison which is being absorbed and the susceptibility of the patient: we can therefore only estimate roughly the amount of antitoxin required to neutralize the poison.

Another most important fact to clearly recognize is that while diphtheria antitoxin only neutralizes the effect of the poisons produced by the diphtheria bacilli, diphtheria itself is frequently a disease due to mixed infection.

The lesions of diphtheria in the pharyngeal type are usually at first due mainly to the diphtheria bacilli, but in the laryngeal cases the frequently complicating bronchitis and pneumonia are due fully as much to streptococci and pneumococci as to diphtheria bacilli. Upon the poisons produced by these cocci the serum has no effect.

Antitoxic Serum.—The serum should be derived from horses, should be clear, and have little or no sediment. It should have no odor other than that of the preservative used. It should be obtained from a reliable source and contain from 200 to 500 units in each cubic centimetre.

The serums which tests have shown to be reliable are those furnished by Parke, Davis and Company, Aronson, Roux, Health Department of New York City, Mulford, and Behring. Many city boards of health, such as Philadelphia, Boston, and Brooklyn, furnish a reliable preparation for free distribution in their respective cities.

Dosage.—This is governed by the size of the patient, the extent and duration of the disease. The serum is injected hypodermically in the subcutaneous tissues of the side of the chest, lumbar region, or elsewhere.

Immunization.—For children under a year 50 to 100 units, for

larger children 200 to 300, and for adults 400 to 500. This will be, of a high-grade serum, from 3 to 15 minims.

Treatment.—The present tendency is rather in the direction of giving larger doses than formerly. Some believe in giving all the serum in one dose, others in several injections.

The serum sometimes produces some slight shock when given in large amounts. This is avoided by dividing the dose. On the other hand, it is contended that in obtaining the full antitoxic effect at once the good obtained more than counterbalances the, as a rule, slight deleterious effects.

My own opinion as to dosage is as follows: For young children with mild throat-diphtheria a single dose of 1000 to 1500 units. If the symptoms do not abate, a second injection to be given in twelve to eighteen hours. For young children with laryngeal diphtheria or with severe nasal or pharyngeal diphtheria an injection of from 2000 to 2500 units should be given, followed by a second injection of the same size twelve to eighteen hours later. In adults the amount should be about one-half larger for cases of equal severity.

The antitoxin serum after being injected into the tissues is allowed to be gradually absorbed without the aid of rubbing.

The Use of Diphtheria Antitoxin in Preventing by Immunization the Development of Diphtheria.—The use of antitoxin in immunization is not less important than in treatment. An injection of from 100 to 400 units, according to the age of the individual, practically ensures him from an attack of diphtheria for at least four weeks. It prevents the necessity of sending children away from an infected household, and allows us to stamp out epidemics from schools and asylums.

At the time of the introduction of antitoxin there were a number of children's asylums in which diphtheria was epidemic. This furnished an unique opportunity to demonstrate the prospective value of antitoxin. It is practically impossible to state whether any given exposed person will or will not develop diphtheria, and thus it is open to doubt whether in any given case the immunity was natural or was acquired by the injection; but the case of asylums, where cases were developing every day, it was a certainty that cases would continue to develop. If in each of these all cases ceased upon the day upon which antitoxin was injected, it could be considered as proven that this sudden stopping of the outbreak was due to the protective power of the antitoxin. If, still further, some of those not injected developed diphtheria, the proof would be all the more certain.

These encouraging results have been obtained in the children's asylums and in the crowded tenements of New York. They encourage the hope that a general use of antitoxin for immunization will to a large

extent limit the spread of diphtheria. At the Mt. Vernon branch of the New York Infant Asylum a case of diphtheria developed on February 18, 1894. Cases continued to develop from time to time, so that in September alone 14 cases occurred. From that time until January 14th there was hardly a day in which a case did not develop. On January 16th and 17th 221 children were each injected with from 100 to 200 units of von Behring's serum. No bad effects were seen, and during the next month but 1 case of diphtheria developed; this was on the fourteenth day. From February 22d to 27th 5 cases appeared, and the children were again immunized. This time they each received from 125 to 225 units of von Behring's standard of a serum prepared under the direction of the New York City Health Department.

No cases appeared after the second immunization for a period of five weeks. Cultures made from the throats of those in the neighborhood of this case showed diphtheria bacilli in the throats of 6 of the children. These 6 were given 200 units each on March 30th. One of these children developed a small patch two weeks later, but had no constitutional symptoms. A case developed on May 3d, and one on May 27th, in the children immunized on February 27th. The hospital has remained since then free of diphtheria, so that no third general immunization has been thought necessary.

At the Nursery and Child's Hospital in New York in the three weeks preceding April 18, 1895, there were 15 cases of diphtheria. Upon that day 136 children, varying in age from three weeks to four years, were immunized by receiving from 50 to 200 units each. The children showed no bad effects from the injections. A temporary rise in temperature occurred in one-fourth of them, which lasted for six to twelve hours. From the day of the injections to the present time no diphtheria has developed in the hospital, with two very interesting exceptions—a physician and a nurse who had not been immunized. Since then the hospital has been free from diphtheria.

At the House of Reception of the New York Catholic Protectory 2 cases of diphtheria developed on July 7th, and 3 cases on July 8th and 9th, 1895. On July 9th and 10th the remaining 67 children were injected with 150 to 600 units each. (The children's ages varied between two and a half and fifteen years.) No diphtheria developed after the injections in any of these children. In August a new set of children were received, and on August 5th a case of diphtheria developed among these, and on August 10th a second. On this day the 37 children who comprised the new lot were injected with from 200 to 600 units. No more diphtheria developed.

The dosage was graded as follows:

2 years	1 case	200 units.
3 "	1 "	250 "
6 "	1 "	350 "
7 to 12 years	20 cases	400 to 500 units.
13 to 20 "	14 "	500 to 600 "

The injection having been made in the forenoon, most of the children showed temperatures of from 99° to 99.5° F. the same evening, two or three reaching 100°, and one 100.6° F. During the two days on which observations were made most of the temperatures subsided to normal, a few remaining at 99° F. No cases except those mentioned later showed any constitutional symptoms after the injections. In only 2 cases was there any local irritation. In 1 of these the symptoms promptly subsided without treatment; the other, unfortunately, developed an abscess.

In the last group of cases, 37 in number, specimens of urine were obtained before the injections to compare with those taken after the administration of the serum. The results of the examinations are as follows:

	Before immunization, August 9th.		After immunization, Aug. 11th.		Aug. 13th.
	Sp. gr.	Albumin.	Sp. gr.	Albumin.	Albumin.
Case 1	10.22	Trace.	. .	Negative.	Negative.
" 2	. .	Negative.	10.30	Trace.	"
" 3	. .	"	. .	"	"
" 4	. .	"	. .	"	"
" 5	10.24	30 per cent. in vol.	. .	60 per cent.	"
" 6	. .	Negative.	. .	16 per cent.	"

One child showed 30 per cent. in volume of albumin (the urine, after boiling and the addition of nitric acid, was allowed to stand for twenty-four hours, and the deposit was then estimated) in the urine before the treatment, and after the injection there was about 60 per cent. in volume. The urine from the sister of this child showed no albumin before the injection, and gave not the slightest evidence of illness other than the albuminuria at any time, and neither showed any temperature-reaction. In both of these cases, as in all the others, the albumin had entirely disappeared two days later.

Nine days after the injections 1 case developed an urticaria which lasted for twenty-four hours. No other cases showing the skin rashes were observed. At the Reception House of the Juvenile Asylum in New York 4 cases of diphtheria developed during the week ending April 11, 1895. On the 12th the children (to the number of about 70) were injected with from 200 to 400 units.

No cases occurred afterward, except that the boys' attendant and an engineer who handled the clothes from the diphtheria children, and who had not received immunizing injections, developed diphtheria.

To me these results seem conclusive as to the immunizing power of injections of from 100 units of antitoxin upward.

Although in these institutions it was impossible to say that any special child would develop diphtheria, still, as before stated, it was an absolute certainty that in each of these institutions more cases would have developed unless in some way the children could be immunized.

About one-sixth of the children had slight albuminuria, and a much smaller percentage developed it to a greater extent. In none, however, were there any other symptoms pointing to any deleterious action on the kidneys, and in none was the albuminuria more than transitory.

In the blood there was noticed a slight temporary diminution in the number of the red blood-cells; no other changes were observed.

Immunization by New York Health Department Inspectors in Infected Families.—For over a year in families in which diphtheria has occurred, and in which there were other children exposed to infection, the Health Department inspectors, acting on their own judgment as to the necessity, have immunized some of these exposed persons. Most of these cases have been among the tenement-house population. A few cases taken at random from the reports of the inspectors illustrate the method:

Family 1.—Five children in family; 2 cases of diphtheria; the other 3 children, aged nine, eleven, and thirteen years, were immunized; no further cases occurred.

Family 2.—Three children in family; 1 case of diphtheria; 2 other children, aged eight and sixteen years, immunized; 1 child had diphtheria bacilli in the throat at the time. No further cases of diphtheria.

Family 3.—Three children in family; 1 case of diphtheria, 1 of the remaining 2 children immunized; second child, aged sixteen, not immunized. This child developed diphtheria three weeks later, and was successfully treated with the antitoxin.

Cases like the foregoing might be repeated almost indefinitely. 1207 persons had been immunized in this way up to October 1, 1896; of these but 11 developed diphtheria, and all recovered except 1 who had scarlet fever as a complication. The cases were kept under observation until the premises had been disinfected, and this was done until the throats of all were free from bacilli.

By the use of antitoxin it has been possible to stamp out completely diphtheria in four great institutions for the care of children in which it was prevailing in more or less epidemic form. In no instance has there been, so far as can be determined, any serious results from the administration of the remedy for this purpose. The

duration of immunity in many cases is apparently not more than thirty days, but it may be for a much longer time. The doses required to confer immunity are probably between 50 and 300 anti-

Table showing the Number of Cases Immunized in New York City, and the Results.

	No. of cases immunized.	No. of units of antitoxin administered.	No. of cases of diphtheria developing among those immunized between 1 and 30 days.	No. of cases of diphtheria developing within 24 hours.	No. of cases of diphtheria developing after 30 days.	No. of cases of diphtheria that occurred in the institutions previous to immunization.
New York Infant Asylum (1st immunization).	224	100 to 200	1 mild on the 19th day.	0	6	107 cases in 108 days.
New York Infant Asylum (2d immunization).	245	125 to 225	1 mild on the 12th day.	0	4	6 cases in 12 days.
Nursery and Child's Hospital	136	50 to 200	0	0	0	46 cases in 90 days; 15 cases in 15 days.
New York Juvenile Asylum	81	150 to 250	0	0	0	12 cases; 3 cases in 2 days.
New York Catholic Protectory	114	150 to 600	0	1	0	5 cases in 3 days.
Bellevue Hospital	11	175 to 225	0	0	0	2 cases in 10 days.
Health Department Inspectors	1207	150 to 500	10 mild, 1 severe.	3	3	* (1 : 30 ; 1 : 31 ; 1 : 55	One or more cases in more than 395 families.
Total	2018		13	4	13	

toxin units, according to the age of the individual treated. The following table of all recorded cases gives an idea of the extent to which antitoxin has already been employed in immunization:

Immunization by Antitoxin.

Total cases immunized	17,576.
Antitoxin units injected	50 to 1000 (usually 150–200).
Attacked within 30 days	129 mild, all recovered.
Attacked after 30 days	20 mild, all recovered.

No serious after-effects observed which could be ascribed to the antitoxin injected.

The results summarized above, when taken in connection with those detailed earlier, seem to me to encourage us to use antitoxin in immunization much more largely than we have done heretofore. Especially should boards of health urge its use in the tenement districts.

The short duration of its immunizing power is of course a drawback, but, as a rule, one or at least two injections would carry the persons treated safely over the duration of the local infection.

THE USE OF ANTITOXIN IN THE TREATMENT OF DIPHTHERIA.—The results vary greatly according to the time at which it is given. When it is injected before constitutional poisoning has occurred, and

* There may have been more cases of which the department has no knowledge.

while the epithelium of the mucous membrane is mostly intact and the membrane but loosely attached, the effects are very marked. As a rule, within twenty-four hours the local swelling and hyperæmia have largely abated, and the exudate or pseudo-membrane, if scanty, has entirely or largely disappeared, and, if thick and extensive, has assumed a peculiar pulpy condition and seems like a slough ready to be cast off. The fever and restlessness or prostration have usually largely disappeared. In laryngeal cases where stenosis is not as yet marked the symptoms usually abate and intubation or tracheotomy is avoided.

When antitoxin is administered later, when constitutional toxæmia is beginning and local necrosis of the epithelium has taken place, the curative changes wrought by antitoxin are less manifest. In these cases the local lesions cease to advance if they had not already come to a standstill. There is otherwise no striking change. Several days may elapse before the throat is clear. If the disease had already lasted several days, after-paralyses and heart failures are to be feared if the local lesions were very extensive. These cases, in a word, cease to advance, and if not already too far advanced they recover more rapidly but in the same way as other cases not receiving the antitoxin.

The laryngeal cases in which stenosis has advanced too far to yield quickly enough to antitoxin to avoid the tube, usually require the tube for a shorter time than formerly. It is well to make a trial of removing the tube in twenty-four to forty-eight hours. Some require it as long as formerly. The antitoxin appears to be without effect upon broncho-pneumonia. Antitoxin exerts no effect whatever on cases profoundly toxic, nor upon streptococcus or pneumococcus infections. It is usually given in these apparently hopeless cases with the idea that we may have over-estimated their gravity.

The Ill Effects of Diphtheria Antitoxin.—A small percentage of cases have a slight rise of temperature immediately after an injection, and in a very few with the rise of temperature a rash develops. The rash is, however, more apt to develop after the fifth day, and occurs in about 10 per cent. of the cases. The eruption may be limited to the point of injection or may more or less completely cover the entire body. It most often appears as an urticaria or erythema, and frequently fairly closely resembles the rash of scarlet fever, and more rarely that of measles. Following the eruption desquamation may occur. In about one-fifth of the cases the rash is accompanied by a rise in temperature of 2° to 4° F. This lasts from one to four days. In a small percentage of cases there is accompanying the rash great tenderness of some of the joints, with at times swelling and redness. The mild cases recover in a few days; the more severe last for some weeks, all finally recovering. The kid-

neys may be slightly affected, but as they are protected to even a greater extent from further injury by the diphtheria poison, the serum really protects rather than injures them.

The antitoxic serum has no effect on paralysis itself. When given early it prevents the development of lesions in the nerves. Among recoveries there are as large a proportion of persons having paralysis as formerly, the reason being that many severe cases now recover which would formerly have died.

It is well in determining the value of a new remedy to obtain the opinion of a great number of persons who have used it and seen its effects. We have abundant means of obtaining such knowledge.

The report of the Paediatric Society's antitoxin investigation is very valuable in giving us information upon the results of the use of antitoxin in private practice and the personal opinions of a great many practising physicians. The committee makes the following analysis of its elaborate and exhaustive report:

1. The report includes returns from 615 physicians. Of this number more than 600 have pronounced themselves as strongly in favor of the serum treatment, the great majority being enthusiastic in its advocacy.

2. The cases included have been drawn from localities widely separated from each other, so that any peculiarity of local conditions to which might be ascribed the favorable reports must be excluded.

3. The report includes the record of every case returned, except those in which the evidence of diphtheria was clearly questionable. It will be noted that doubtful cases which recovered have been excluded, while doubtful cases which were fatal have been included.

4. No new cases of sudden death immediately after injection have been returned.

5. The number of cases injected reasonably early in which the serum appeared not to influence the progress of the disease was but 19, these being made up of 9 cases of somewhat doubtful diagnosis, 4 cases of diphtheria complicating measles, and 3 malignant cases in which the progress was so rapid that the cases had passed beyond any reasonable prospect of recovery before the serum was used. In 2 of these the serum was of uncertain strength and of doubtful value.

6. The number of cases in which the patients appeared to have been made worse by serum were 3, and among these there is only 1 new case in which the result may fairly be attributed to the injection.

7. The general mortality in the 5794 cases reported was 12.3 per cent.; excluding the cases moribund at the time of injection or dying within twenty-four hours, it was 8.8 per cent.

8. The most striking improvement was seen in the cases injected

during the first three days. Of 4120 such cases, the mortality was 7.3 per cent.; excluding cases moribund at the time of injection or dying within twenty-four hours, it was 4.8 per cent.

9. The mortality of 1448 cases injected on or after the fourth day was 27 per cent.

10. The most convincing argument, and to the minds of the committee an absolutely unanswerable one, in favor of serum-therapy is found in the results obtained in the 1256 laryngeal cases (membranous croup). In one-half of these recovery took place without operation, in a large proportion of which the symptoms of stenosis were severe. Of the 533 cases in which intubation was performed, the mortality was 25.9 per cent., or less than half as great as has ever been reported by any other method of treatment.

11. The proportion of cases of broncho-pneumonia—5.9 per cent.—is very small and in striking contrast to results published from hospital sources.

12. As against the two or three instances in which the serum is believed to have acted unfavorably upon the heart might be cited a large number in which there was a distinct improvement in the heart's action after the serum was injected.

13. There is very little, if any, evidence to show that nephritis was caused in any case by the injection of serum. The number of cases of genuine nephritis is remarkably small, the deaths from that source numbering but 15.

14. The effect of the serum on the nervous system is less marked than upon any other part of the body, paralytic sequelæ being recorded in 9.7 per cent. of the cases, the reports going to show that the protection afforded by the serum is not great unless injections are made very early.

The committee states that, while it has endeavored to present the favorable results with judicial fairness, it has also tried to give equal or even greater prominence to cases unfavorable to antitoxin. It acknowledges its indebtedness to members of the profession who have co-operated so actively in this investigation, and to Dr. A. R. Guerard for the preparation of the statistical tables. The report is signed by L. Emmett Holt, M. D.; W. P. Northrup, M. D.; Joseph O'Dwyer, M. D.; Samuel S. Adams, M. D.

The Action of the Society upon the Report.—The society voted to accept the report of the committee, and after a full discussion it was decided to embody its conclusions in the following resolutions:

I. For a child over two years old the dosage of antitoxin should be, in all laryngeal cases with stenosis and in all other severe cases, 1500 to 2000 units for the first injection, to be repeated in from eighteen to twenty-four hours if there is no improvement; a third dose

after a similar interval if necessary. For severe cases in children under two years and for mild cases over that age the initial dose should be 1000 units, to be repeated as above, if necessary; a second dose is not usually required. The dosage should always be estimated in antitoxin units, and not of the amount of serum.

II. The most concentrated strength of an absolutely reliable preparation should be used.

III. Antitoxin should be administered as early as possible on a clinical diagnosis, not waiting for a bacteriological culture. However late the first observation is made, an injection should be given unless the progress of the case is favorable and satisfactory.

A most convincing demonstration of the value of antitoxin is furnished by the experience of Baginsky during an involuntary pause in the serum treatment caused by failure in the supply of serum. Between March 15, 1894, and March 15, 1895, there were treated in Baginsky's service by antitoxin 525 children, with a fatality of 15.6 per cent. During the period of forced interruption of the serum treatment, this period being chiefly the months of August and September, 126 children were treated without antitoxin, with a fatality of 48.4 per cent. There was absolutely no selection of cases in either group. In his comments upon this experience Baginsky says:

"It is all the more remarkable as the ratio of mortality of those treated with the serum both before and after the period of interruption varied within very small percentage figures.

"If one will permit figures to speak at all, there has scarcely been made on human beings a more demonstrative test of the curative power of a therapeutic agent. It was an experiment forced upon us, but it proved to us how terrible was the form of disease which we were treating, and how numerous would have been the victims without the use of the healing serum."

Statistics.—The following statistics, gathered by Dr. Guerard, have been kindly furnished for my use. They give valuable testimony as to the value of diphtheria antitoxin.

1. Cases and deaths reported in Berlin and New York and deaths in Paris:

	Berlin.		Paris.	New York.	
Year.	Deaths.	Cases.	Deaths.	Deaths.	Cases.
1889	1284	4220	1890	2291	6489
1890	1586	4586	1859	1783	4350
1891	1078	3504	1531	1970	4874
1892	1405	3683	1557	2106	4654
1893	1643	4315	1266	2558	6468
1894	1430[1]	5220	1009[1]	2870	9155
1895	996	6106	441	1956[1]	9925
1896	588[2]		600[2]	1856[2]	

[1] Use of antitoxin begun.

[2] Last quarter of year, partly estimated.

2. Absolute death-rate per 100,000 population:

Year.	Berlin.	Paris.	New York.
1886	125.7	73.2	187.5
1887	100.7	76.9	206.6
1888	76.1	83.7	167.7
1889	85.6	79.9	146.2
1890	102.0	77.5	110.6
1891	67.5	63.0	118.7
1892	92.9	63.6	123.3
1893	100.8	51.4	145.5
1894	86.7	40.7	158.5
1895	59.7	17.7	105.2
1896	30.9	17.5	91.3

The foregoing tables show that, coincident with the use of antitoxin the actual number of deaths from diphtheria in the cities of Berlin, Paris, and New York decreased.

The reduction in the mortality would be much greater if antitoxin were given to all cases. Even in such cities as New York, where antitoxin is furnished free to poor persons, many still refuse its use. Thus the investigation of 336 consecutive fatal cases occurring during the past summer and fall showed that in 212, or 63 per cent., of them antitoxin was not employed. Even many of those cases in which antitoxin was employed received it too late to hope for any effect; thus, of the 124, 41 were moribund or hopelessly ill at the time of injection, and 33 more were injected after the fifth day. Without regard to our belief in the curative value of antitoxin, we would all agree that where two-thirds of the fatal cases receive no antitoxin it is unfair to assert that the still large, though greatly lessened, mortality present in the cities gives the full measure of the value of antitoxin.

3. Mortality in diphtheria treated with antitoxin, and previous mortality without antitoxin:

	Cases.	Deaths.	Mortality, per cent.	Previous mortality, per cent.
Hospital cases	15,560	3009	19.0	
Private cases	9,208	995	10.1	
Total	24,768	4004	16.0	30 to 40

(Cases moribund at the time or dying within twenty-four hours after are included in these statistics.)

4. Mortality of diphtheria treated with and without antitoxin at the same time or during the same period:

	Cases.	Deaths.	Mortality, per cent.
Hospital, with antitoxin	7986	1754	21.0
" without antitoxin	9039	3309	36.4
Private, with antitoxin	3161	412	13.0
" without antitoxin	4255	1717	40.0
Total, with antitoxin	11,147	2161	19.1
" without antitoxin	13,294	5026	37.8

(The antitoxin cases were often severe cases taken as tests.)

5. Mortality of operative and non-operative cases of diphtheria treated with antitoxin, and previous mortality of operative cases without antitoxin:

	Cases.	Deaths.	Mortality, per cent.	Previous mortality, per cent.
Non-operative cases	12,066	1491	13.5	
Operative cases	3,082	1135	36.7	65
Total	15,148	2626	16.6	
Tracheotomy	1355	569	42.0	70
Intubation	1173	361	30.8	56.5
Intubation and second tracheotomy	52	37	71.0	
Intubation or tracheotomy	502	168	33.2	

6. Mortality of diphtheria with antitoxin, arranged according to age:

	Cases.	Deaths.	Mortality, per cent.
0–2 years	1494	469	31.4
2–5 years	3678	762	20.7
5–10 years	3184	473	14.8
Over 10 years	1444	99	6.9
Total	9800	1803	18.4 (chiefly hospital).

7. Mortality of diphtheria with antitoxin, arranged according to day of disease on which treatment was commenced:

	Cases.	Deaths.	Mortality, per cent.
First and second day	4,232	267	6.3
Third and fourth day	3,870	656	17.2
After fourth day	1,984	605	34.6
Day unknown	339	44	13.0
Total	10,425	1672	16.0

(Moribund and dying within twenty-four hours included.)

The results given in the above tables seem to me to absolutely prove that under the diphtheria-antitoxin treatment less than half as many cases die as formerly.

Streptococcus Antitoxin.—The blood of horses which have been subjected to repeated and increasing doses of virulent cultures of streptococci contains certain curative substances which seem to possess both feeble antitoxic and bactericidal properties against the poisons produced by the streptococci and the germs themselves.

As yet developed, these curative substances are far weaker than those in diphtheria antitoxin, and are as yet of more value as a preventive than as a cure.

As already stated, many cases of diphtheria are due to mixed infection, and in many the fatal effect is due largely to a secondary septicæmia, bronchitis, or broncho-pneumonia. These diseases are due

usually to the action of streptococci, less frequently to that of the pneumococci. When due to the streptococcus the serum is probably of some value. The French are enthusiastic in its praise, the Germans doubtful. My own experience in a dozen cases seems to indicate that it has a very moderate preventive and perhaps some curative power. Marmorek's preparation is used in 10 to 15 c.cm. doses, to be repeated every twelve to twenty-four hours so long as the temperature and lesions persist. In time the serum may be of more value.

Diphtheria Bacilli in Healthy Throats.

Investigation has shown that quite frequently the throat-secretions of those who come in contact with diphtheria become infected with diphtheria bacilli. These bacilli may remain inactive in the throat for a time, and then cause later an attack of diphtheria, or they may be transmitted to others, and thus produce disease. The following investigation reveals how frequently bacilli are found in healthy throats: The throats of the healthy children of 14 families, in which one or more of the other members had diphtheria, were examined by cultures. There were, in all, 48 healthy children. In 50 per cent. of these diphtheria bacilli were found; 40 per cent. developed later, to a greater or less extent, the lesions of diphtheria. In considering the high percentage of cases in which the virulent Löffler bacillus was found, it must be remembered that in these families the conditions were the best possible for the transmission of the contagion.

In numerous instances cultures have been made from the throats of healthy children in families where the diphtheria case was well isolated; in such cases the bacilli have been found in less than 10 per cent. of the children. Even here contact with the sick was allowed up to the time the disease was diagnosticated.

Of many examples in which the bacilli in healthy throats have been found to produce diphtheria in the persons infected or in others the following are given as illustrations:

In a family of 8 children 1 child sickened with diphtheria, and a second child, a baby, was sent to a neighbor. The next day cultures showed this baby, as well as 2 of the other children, all of whom were apparently healthy, were infected with diphtheria bacilli. The 3 apparently healthy, but infected, children, as well as the sick one, were at once quarantined, but already one of the family to which the baby had been sent had contracted diphtheria from it.

A very striking instance of this was the following: In a family of 4 children 1 was sick with diphtheria. The department inspector found 3 other children in the same bed with the sick one, who was constantly spitting upon and soiling the bed-clothes. He made cultures from these 3 children, whose throats appeared healthy, as well

as from the sick one; all contained abundant characteristic Löffler bacilli (these were later shown to be virulent by the inoculation of guinea-pigs). When the inspector visited the same family three days later he found that 2 of the previously healthy children had meanwhile sickened and died, and that the third was severely ill. This child finally recovered.

From the observation detailed above we cannot escape the conclusion that all members of an infected household should be regarded as under suspicion, and in those cases where isolation is not enforced the healthy as well as the sick should be prevented from mingling with others until cultures from the throat have shown the absence of bacilli or a sufficient lapse of time gives the presumption that they are not carriers of the contagion.

Diphtheria Bacilli in the Throat-secretions of Convalescent Cases.—The length of time elapsing between the inception of the disease and the date of the last culture showing the presence of the Klebs-Löffler bacillus in the throat of each patient was tabulated at the laboratory for 2150 cases. The average interval between the last culture showing the presence of the bacilli and that showing their disappearance is probably about eight days. The bacilli may, therefore, have persisted in many cases for a longer period than that recorded.

Of the 2150 cases tabulated, in 864 the last cultures showing bacilli to be present were made within six days or less from the inception of the disease, and may be considered in the main as made for diagnosis.

The remaining 1286 cases are tabulated as follows:

Time from inception of disease, bacilli present,	7th day and over.	14th day and over.
Number of cases	1286	741
Per cent. of total cases (2150)	59.81	34.46

Time from inception of disease, bacilli present,	21st day and over.	28th day and over.	35th day and over.	42d day and over.
Number of cases	328	155	68	31
Per cent. of total cases	15.25	7.21	3.16	1.44

Time from inception of disease, bacilli present,	49th day and over.	56th day and over.
Number of cases	16	9
Per cent. of total cases	0.79	0.42

In the 9 cases in which cultures showed the presence of the bacilli for 56 days and over from the inception of the disease these cultures were made as follows: One each on the 57th, 58th, 60th, 61st, 62d, 63d, 64th, 88th, 90th, and 91st days, respectively. The above tabulation is chiefly of interest as showing the long persistence of the Klebs-Löffler bacillus in the throat in exceptional cases.

The virulence of the bacilli thus persisting has been tested in a number of cases, with results entirely confirmatory of those reported for the previous year. In every case tested, the bacilli retained their virulence irrespective of the duration of persistence in the throat. The case in which the bacilli were found to be present on the 91st day presents points of special interest. It was that of a child three months old when first coming under observation, in which the clinical symptoms were confined to a simple nasal discharge. There were no constitutional symptoms whatever. The nurse, and later the mother of the child, contracted diphtheria from it, the disease in the mother's case being of a severe type. The bacilli were tested at frequent intervals up to five weeks from the inception of the disease, and were found to be virulent in every instance.

The demonstration of the frequent presence of diphtheria bacilli for weeks after the complete disappearance of the membrane indicates clearly that the patients must be isolated so far as possible, not only during their illness, but also afterward. The throat-secretions are to be considered dangerous until at least three weeks after the beginning of the attack.

Wherever possible the disappearance of the diphtheria bacilli should be established by the bacteriological examination of cultures. At the conclusion of the illness the bedding and, where possible, the carpets should be disinfected by steam, and the furniture, floor, and walls wiped off with a 1 : 500 solution of bichloride of mercury. Finally, it is well to burn three pounds of sulphur to each 1000 cubic feet of air-space in the patient's room.

The disposal of the children in an infected family is a matter of great importance. They frequently have already become infected before the first case is diagnosticated, and if sent away they may carry the disease to the children in the families which they visit. It is wise, therefore, not to send them away, unless they have not been exposed to the one taken sick, and only then to places where there are no children. All those who have been exposed or expect to be exposed should receive a moderate injection of antitoxin as a preventive, 100 to 300 units according to age. It is well also to frequently gargle the throat and cleanse the nostrils with some mild cleansing solution, such as Dobell's or a weak disinfectant, such as 1 : 10,000 aqueous solution of bichloride of mercury. An immunizing dose of antitoxin, together with the frequent cleansing of the throat, will practically ensure an immunity from diphtheria.

Local Treatment.

If one could destroy the diphtheria bacilli at a time when they are localized, extension of the disease to distant parts might be prevented.

Many clinicians of great experience in the treatment of diphtheria have advised various methods to accomplish this desired result, but personally I believe that their success must always be limited, and for the following reasons: The diphtheria bacilli are not limited to the exact spot where the pseudo-membrane has developed. They are present in the throat-secretion, bathing all parts of the pharynx and tonsils before even the local lesions are manifest. Lying thus in the crypts and recesses of the parts, they are not killed by such antiseptic fluids as are attempted to be applied to them. Further, at those places where local lesions are apparent the bacilli are already present beneath the superficial layers of membrane, and cannot be directly influenced by antiseptic fluids.

If the bacteria were upon a dead surface, we could kill them, but to destroy them without injuring the living epithelium is a very different undertaking. Just a year ago a series of experiments were carried out by the resident physicians of the Willard Parker Hospital for Contagious Diseases (Drs. White and Somerset) to test the comparative value of irrigating the nose and throat with simple cleansing solutions and with disinfectants (1 : 4000 bichloride of mercury and 5- to 10-volume solutions of peroxide of hydrogen). After a pretty thorough trial it was very difficult to see more than a trifling advantage in the antiseptic solutions.

If we attempt to kill the bacilli by caustics or actual cautery, we are apt to injure the tissues without killing the bacteria, so doing more harm than good. I believe, therefore, that we should not use any treatment which will irritate or lacerate the mucous membrane. I believe that no swab should be used to make applications to the mucous membrane unless it is done by the physician or by a trained nurse, and only then with the greatest care. Personally I prefer to trust to irrigation. For the nostrils I prefer a simple tepid salt solution (one teaspoonful of salt to a pint of water). This is best applied through the fountain syringe. If the nostrils are so firmly plugged that great pressure is needed, then an ordinary hard-rubber syringe can be used. To its point is attached a short rubber tube, ending in a bulb, to fit the nostrils. The force needed may be very great, but the shock is of less harm than the continued total occlusion of the nostrils with the probable production of sepsis.

When the local lesions of diphtheria are limited to the tonsils, irrigation of the nostrils is unnecessary, but when the posterior nares and pharynx are involved, the nostrils should be irrigated three to six times a day. Even weak solutions of peroxide of hydrogen are often very irritating to the nasal mucous membrane. Great care should be taken if it is thought desirable to use this substance. For the irrigation of the mouth and pharynx either a normal salt solution or a

1 : 4000 bichloride-of-mercury or a 5-volume peroxide-of-hydrogen solution may be employed.

In older children and adults the cleansing and soothing effects of irrigation are often marked. In these cases I prefer to use irrigation with warm salt solution every hour or two, and then every three hours to irrigate with some antiseptic solution, especially a 1 : 4000 bichloride solution. The irrigation of the throat is, as in the case of the nostrils, best carried out by the fountain syringe.

When the nostrils and pharynx are clogged by discharge and membrane, it is necessary to clean them if the child's strength will permit. For local treatment the solution recommended by Löffler has received high praise. Personally, I do not believe its application gives any better results than bichloride-of-mercury or peroxide-of-hydrogen solution. It is a mixture of menthol ʒiij, dissolved in toluol ʒix, liquor ferri chloridi ℥j, and absolute alcohol ℥ij.

No new drugs besides antitoxin have been added during the past three years that I believe to have any advantage over the older remedies. For feeble heart-action and prostration alcohol and strychnine are still the best remedies. A moderately low temperature and plenty of fresh air are of great importance in the successful treatment of diphtheria. The tincture of the chloride of iron, though still largely given, is used in smaller quantities, and by many its use is not advocated at all.

When there is difficulty in swallowing after intubation or from paralysis of the muscles of deglutition the patient is fed by gavage, the soft-rubber tube being passed, as a rule, through the nostrils. The internal administration of bichloride of mercury seems to me to be of doubtful value.

Inhalations of steam and emetics are not seldom used in laryngeal diphtheria. Calomel fumigation is still employed by many, and undoubtedly has some value in relieving stenosis.

Since the introduction of antitoxin intubation is even more rapidly than formerly replacing tracheotomy. O'Dwyer has recently supplied a new variety of tube for those cases in which the tube-opening becomes frequently plugged with exudate or membrane. These tubes are shorter and of much larger lumen than the usual form. They are of uniform size throughout their entire length, and are made of thin metal.

Antitoxin, though it does not exclude the use of any of the drugs formerly employed, yet, by shortening the duration of the disease and lessening its severity, makes unnecessary the employment of many remedies which are of doubtful value. In many cases we do everything advisable when we require rest in bed and attend to the cleansing of the throat and to the diet.

ASTHMA, BRONCHITIS, AND WHOOPING COUGH.

By NORMAN BRIDGE, M. D.

ASTHMA.

Asthma is a symptom-complex of some inducing pathological state; rather of two or more such states depending on each other. Objectively and subjectively, it is a struggle of more or less severity to force air into and out of the chest. Other symptoms sometimes occur in addition, but these are the primary and essential ones of the disease. We know the smaller bronchi are in some way reduced in diameter or have their lumen reduced, and several theories have been invoked to explain this phenomenon.

It is this lessening of the air-carrying space within the tubes that mechanically and directly induces the symptoms. But the change in the tubes is the result of some other preceding pathological state or irritation, either in this or some other and perhaps far removed part, and which is sometimes undiscoverable. This primary cause is certainly not always the same, but there is small reason to doubt that it generally consists in some disorder, disease, or peculiarity of the nervous system. Asthma occurs mostly in paroxysms coming on suddenly, more often in the night, which last perhaps an hour and suddenly subside, or a seizure may develop slowly, and, whether beginning abruptly or gradually, one may last many hours or days with only occasional fluctuations in severity. The suffering and annoyance from the dyspnœa vary from the most trifling discomfort to the most extreme and pitiful struggle for the breath of life, with profuse perspiration, swollen features, and extreme cyanosis, the patient the while sitting or standing with the body bent slightly forward and the clothing about the neck and chest loosened to give fuller action to the muscles.

Other pathological conditions often accompany it, as bronchitis, emphysema, and bronchorrhœa, but fever never attends pure asthma. Emphysema often develops in the chronic form with chronic bronchitis. A pronounced case of emphysema often appears, for obvious

reasons, to be one of asthma, when there may be at the moment no narrowing of the diameter of the bronchi. During an attack the patient is often completely free from any other symptom than the wheezing and laborious breathing, and before and after it he is often perfectly well, so far as can be discovered.

Numerous circumstances are known to cause paroxysms of asthma. The most important and wellnigh essential condition is some peculiarity of the nervous system, sometimes, but probably not often, hereditary, which for want of a better designation we call personal idiosyncrasy. It is an excessive susceptibility to slight influences that tend to produce an attack, and leads to paroxysms when no other cause can be discovered, the ordinary conditions of the patient's environment being enough at times to bring one on. The susceptibility fluctuates: at one time the inhaling of the dust emanating from an occupied room will cause an attack, at another only the breathing of some extremely irritating substance is capable of doing it. After all, the personal idiosyncrasy may depend mostly on some inscrutable vice of system, of the secretory organs perhaps inducing the nervous susceptibility, rather than in any organic state of this system itself. But often a direct causative condition may be found, especially if we search carefully for it. Various irritating substances inspired often produce it, as vegetable or animal dust of certain kinds; dust from old hay or straw, from feather beds and pillows; powder of ipecacuanha and the fumes of tobacco; various gases, as chlorine; the emanations from burning tar, from horses and their stables, henhouses, and animal cages; from certain flowers, as fragrant lilies and the tuberose; and a hundred other things of the most diverse sorts.

A more common etiological factor, probably, is some irritation of extra-bronchial organs capable of inducing the asthma by reflex action. Irritation of the nasal passages by polypi, hypertrophy, or some extraneous influence, and hyperæsthesia of these parts, cause many cases, just how large a proportion it is impossible to say, but probably 15 to 20 per cent. at least.

A more common cause of the disease or its aggravation is a derangement of some part of the digestive system. In many susceptible persons almost any irregularity in diet, over-eating, or the use of food not easily digested by the particular individual is sure to bring on an attack. Irritation or disease of many other organs may in those predisposed induce disease; among these are the sexual organs in both sexes, the heart, lungs, the spinal column, the kidneys, and the bladder.

There is some recondite influence in certain localities capable of inducing or relieving the affection, and the places differ to some extent for different patients. Hence changes of residence often

relieve, or aggravate, if they do not produce the disorder—as going from a moist to a dry atmosphere, from a lower to a higher altitude, or *vice versâ* (and often a few hundred feet will produce a marked change), or from the city to the country or the reverse.

Then, such nervous influences as fear of asthma or of some other calamity, or fright, apprehension, or mental overwork or worry, are probably capable of inducing, in certain persons, true asthmatic seizures. But quite a proportion of such seizures, at least to first appearances the so-called nervous asthma, are really only instances of the difficult breathing of laryngeal spasm.

The pathology of asthma has been the subject of much study and considerable disputation for many years. The physiological or anatomical changes, whatever they are, that directly induce the symptoms must be capable of sudden occurrence. Muscular spasm in the walls of the bronchi would seem to be a rational theory of such change. Muscular fibres exist to a considerable extent in the walls of the small bronchi, which are under the control of the pneumogastric, recurrent laryngeal, and the sympathetic nerves, and it seems to be experimentally proven that by sudden spasmodic contraction they can cause asthmatic breathing. Well-known analogues of such phenomena are the spasm of the glottis, of the sphincters of the bladder, anus, and of the œsophagus. Irritation of the vagi in animals causes contraction of the bronchi and dyspnœa. But it is not necessary to assume that muscular bronchial spasm causes all cases of asthma, nor is it at all likely to be the case. Sudden swelling of the bronchial mucosa can easily create such a narrowing of the air-channels as to make respiration difficult. That such thickening does occur there ought not any longer to be a particle of doubt. A patient will sometimes within a minute after inhaling a whiff of some offensive substance find nasal breathing difficult, and in five minutes quite impossible, from sudden swelling of the nasal mucous membrane. Erectile tissue is a name given to parts of this structure to express its capability for sudden and extreme engorgement.

A meal of shellfish out of condition or at times in perfect condition may cause, always and only in a susceptible person, a marked urticarious swelling of the face, neck, and hands within a few minutes.

Then we have the sudden, startling swelling of the tongue from obscure causes, infrequent but positive, and induced, it seems certain, by some cause outside of the oral cavity, probably in some reflex irritation of the nervous system. The condition usually subsides in a few hours regardless of treatment. Localized swellings of the skin and subcutaneous tissue are common enough, and uninduced by renal or cardiac disease or by obstruction to circulation of the part by pressure, and unassociated with any cause of general anasarca. This con-

dition has been aptly called angio-neurotic œdema—a name that well expresses some of the facts known about it; one it fails to express is that muscular fibres in the vessel-walls are perhaps concerned in producing the phenomena.

Frequently an attack of asthma that has lasted a number of hours without cough will subside with a cough and profuse bronchorrhœa. It is more rational to suppose such an event following what may be called an angio-neurotic swelling of the bronchial mucous membrane than a spasm of the muscular fibres of the bronchi, whose contraction is confined to reducing the diameter of these tubes. Decidedly the muscular-spasm theory is less supported by the facts than that of angio-neurotic swelling of the bronchial mucosa. Nor can the presence of the somewhat characteristic crystals and spirals in the bronchial mucus in cases of asthma be said to particularly support the theory of bronchial spasm. If the crystals are the active causative irritant, as has been suggested, they unquestionably first harm the mucous membrane, and might more readily cause first the angio-neurotic swelling. But since the crystals have been found in the secretions or products of several other parts of the body, in bronchial mucus in non-asthmatic cases, and even develop in bronchial mucus outside the body, and since the spirals have been found in other diseases, they can scarcely be considered as exercising any powerful influence in causing asthma. They are of value for diagnosis, and search for them should be made in any doubtful case.

Some observations have been recorded which indicate that just before an attack of asthma eosinophile corpuscles of the blood and lymphocytes are considerably increased, to lessen promptly afterward; while the neutrophile cells decrease before and increase after an attack. If these changes should be found to be constant, or nearly so, it would be a most important step in the pathology of the disease.

Although asthma from the standpoint of **diagnosis** is usually a self-evident disorder, it is not unfrequently confounded with other affections. Occasionally a case of suddenly occurring severe dyspnœa of uræmia is mistaken for asthma. There should be no difficulty in making the distinction even from the symptoms, for, unless there is pulmonary œdema and much rattling, the character of the breathing is hardly like that of asthma: it is dyspnœa without evident obstruction, and of course if there is much rattling uræmia should be suspected. There is nearly always in a case of uræmia, bad enough to produce paroxysms of dyspnœa, some œdema or cachexia, or both. The absence of these should never lead to the exclusion of renal disease in a suspicious case, but the urine should always be examined critically.

The inability to rest in the horizontal posture without more or less

difficulty of breathing, due to organic heart disease, has led to a diagnosis of asthma, but this could occur only on a most cursory consideration of the symptoms and signs of any case. The breathing is non-asthmatic, the dyspnœa is aggravated by exercise, and in cases where from dilatation and elongation of the blood-vessels of the lungs and thickening of the connective tissue about them, even with the addition of some œdema, there is embarrassed breathing, the barest history of the case and a touch of the pulse will nearly always tell the nature of the case, and auscultation, which should never be omitted in any chest disorder, will certainly discover the heart-lesion.

Spasm of the laryngeal muscles is often enough mistaken for asthma, but here too a little care should make a diagnosis easy. The obstruction is chiefly of inspiration, which is often loud and stridulous while expiration is noiseless (that of asthma is more of expiration); in severe cases inspiration is attended with great effort, and the wheezing has a loud laryngeal quality quite unlike that of asthma. The ear inclined toward the patient would generally locate the obstruction in the throat rather than in the chest, and auscultation of the chest fails to discover the fine sibilant râles and the low-pitched, prolonged expiration of true asthma. The respiratory sounds are laryngeal, and more like the quality of extreme bronchial, or even tracheal, breathing, never found in pure asthma. All doubt is cleared up by the laryngoscope, but usually the agitation or youth of the patient makes it impossible to use this instrument.

There is a nervous, hysterical dyspnœa rarely met with supposed to be asthmatic. Sometimes the form is that of laryngeal spasm—laryngismus stridulus; sometimes a dyspnœa with no particular obstruction, and therefore resembling the uræmic form. This nervous form is sometimes brought on by fright or fear, apprehension, anger, or by over-indulgence in stimulants or brain-poisons of some kind—alcohol, tea, coffee, or tobacco—in which case there is usually some præcordial distress or sense of weight, and more apparent mental fear of suffocation than there is in true asthma.

Membranous croup is sometimes mistaken for asthma, but here, again, the history of the case ought to exclude it, for this form of croup comes on slowly and progresses gradually to the severest dyspnœa, whereas asthma supervenes suddenly. The croup causes aphonia always, asthma never.

Paralysis of the abductors of the vocal cords allows them to fall together and produce more or less obstruction of inspiration, resembling the laryngeal spasm in symptoms and physical signs. The laryngoscope in these cases shows the cords close together with the slightest opening between them. The inspiration is difficult, the expiration always noiseless.

Tumors of the larynx, trachea, bronchi, and lungs, and rarely contractions of adventitious fibrous tissue in fibroid phthisis, causing pressure upon some of the larger bronchi, sometimes appear to simulate asthma, at least to some extent, for the physical signs resemble more those of spasm of the glottis, and the peculiar bronchial quality of breathing is unlike that of asthma. Besides, the tumor or other causal lesion can usually be demonstrated, and the obstruction from tumor or pressure has come on gradually, almost never with the suddenness of a fit of asthma. It is true that in these several pathological conditions there are occasional paroxysms of more marked obstruction and difficulty of breathing, but they are either due to the superaddition of slight spasm of the glottis or to fright or other emotional demoralization on the part of the patient; and in either case the bronchial quality of the breathing is exaggerated.

The disablement of one lung by extensive pleuritic effusion or empyema, throwing all or most of the labor of respiration on the opposite one, has more than once led to a false diagnosis of asthma. But the most casual study of any such case ought to prevent the error.

Emphysema and chronic bronchitis, which usually occur in combination, offer the chief difficulty in diagnosis in a critical study of asthma. The physical signs are, many of them, the same in the two conditions: there are prolonged, low-pitched expiration, sibilant râles, and labored breathing. But at the same time there is often increased percussion resonance, more or less of the "barrel" form of chest, with a history of chronic bronchitis, and many exacerbations of acute inflammation. Asthma is not infrequently associated with chronic bronchitis, and so is in a measure responsible for the occurrence of emphysema. Emphysema and bronchitis, and the two combined, are gradual in their development, and never have any such history of sudden occurrence of dyspnœa as characterizes every case of asthma. If severe enough to produce dyspnœa, this symptom is rather constant; there is never such sudden cessation of dyspnœa as belongs to all cases of asthma. Such exacerbations as do occur are the gradually developed attacks of acute bronchitis implanted upon the chronic form.

The prognosis of asthma is favorable so far as concerns immediate danger in a paroxysm. The patient sometimes looks and acts as if he were about to die, but he does not die. But if the seizures are frequent and prolonged, and accompanied by chronic bronchitis, eventually bringing on emphysema, the patient may be worn out and his life shortened, or he may become so reduced as to succumb to an acute attack of the bronchitis, or some intercurrent affection.

Treatment.

The treatment of asthma should be systematic and rational, not hap-hazard, and a definite course of sequential procedure should be carried out if possible.

Frequently, the case is first seen in the midst of a paroxysm, which demands relief at once. Palliatives must generally be used, but even here a hasty inquiry into the cause may enable one to remove it by an emetic (sulphate of zinc 20 to 40 grains, or Turpeth mineral 1 to 4 grains, or ipecacuanha 10 grains), expelling a quantity of undigested food from the stomach, to the instant relief of the patient; or irritating intestinal contents may be expelled by an enema of the normal salt solution (6 parts of chloride of sodium to 1000 of water); or some baneful influence in the atmosphere being respired may be discovered and quickly eliminated; or an irritated nasal mucous membrane may be soothed by the application, on a small probang, of a trifle of a 4 per cent. solution of cocaine or by a simple spray of albolene.

The most simple and generally efficient palliative of an attack, proven by the experience, with or without advice, of unnumbered cases, is the inhalation of the fumes of burning stramonium or potassium nitrate, or the two together. A large number of proprietary preparations of these articles, with various non-essential additions and put up in various forms, have been used with more or less benefit. Many of them contain some balsamic or other aromatic substance capable of producing, besides a pleasant odor, some slight anti-spasmodic effect, but it is safe to say that they all contain one or both of the articles named as their cardinal ingredients. A common domestic compound is made by saturating bibulous paper with a strong solution of saltpetre and the fluid extract of stramonium, and drying it. It burns readily and slowly, and may be used as freely as the patient finds to his advantage. He can hold his face over the burning paper or by the use of a paper funnel concentrate the fumes. Some relief is usually found in a few minutes, but sometimes no benefit is experienced.

The iodide of ethyl is a useful remedy, and may be given cautiously by inhalation; it often gives prompt temporary relief. Chloroform is more promptly efficient, but the relief is evanescent; it requires to be given repeatedly, almost continuously, during an attack. There is danger that if the patient handles it himself he may take too much, may even fall asleep with the open bottle near his face, and fatal narcosis ensue. Ether has nearly the same effect as chloroform, but is rather less efficient and agreeable. Both drugs are safe in any moderate amount, and should be inhaled in many small and repeated doses.

The best way is to press firmly against the open mouth of the bottle a folded napkin, while the bottle is quickly tipped over against it. The cloth will bring away not over 5 to 15 drops, and should be held to the face by the patient himself, who the instant narcosis is even approached will let his hand fall, thus acting as an automatic safeguard against danger. This dose may be repeated as often as necessary. Asthmatic patients are quite tolerant of these drugs, and in the way indicated they may be used for many hours without danger. But at the best they are only a palliative to repress the symptoms until the exciting cause or the greater susceptibility has passed off, and are not known to reduce the frequency of the attacks.

Pyridine is alleged to cut short a paroxysm of asthma when taken by inhalation (a few drops being placed in a saucer and held near the face), and also to cause a freer flow of mucus into the bronchi with a sense of relief. But the odor is so pungent and disagreeable that few patients willingly take it. Inhalations of the nitrite of amyl will sometimes cut short a paroxysm of asthma. The drug should be used with the greatest caution.

The hydrate of chloral is in some cases an efficient remedy for the attack, but is not prophylactic. A large single dose (20 to 30 gr.) is better than several smaller ones, and in a few minutes the relief is usually marked, but sometimes no effect is produced, and the after-symptoms are to a few persons disagreeable. The remedy may be tried if the inhalations are not efficient, but even if it works well and produces no bad after-effects, it should not be used often, for in some people one dose of this drug creates a demand for more.

The nauseants are useful in a paroxysm, especially lobelia, which was more used formerly than now, but these drugs are so disagreeable when carried to the extent of producing marked nausea, which is necessary to have the best effect on the asthma, that patients wisely refuse to take them except as a last resort. A much better class of remedies are the coal-tar analgesic preparations, antipyrin and phenacetin especially, which have real merit and very rarely disagreeable immediate or after-effects. They doubtless act in the same manner as they do in migraine or neuralgia. One rather large dose, 10 or 15 grains (adult), may be taken at the beginning of a paroxysm, and usually need not be repeated. Prompt amelioration is likely to ensue, but sometimes no effect whatever is produced.

Taken at the beginning of an attack, a single dose of morphine ($\frac{1}{8}$–$\frac{1}{4}$ gr. hypodermically) will generally promptly abort it, and if paroxysms occur only at long intervals this is a proper remedy, but if the attacks are frequent and it were to be given each time, the danger of forming the morphine-habit would be a serious objection to its use. Some patients find the after-effects of the morphine so

disagreeable that they prefer to have less relief by the inhalation of the nitre and chloroform, which are unobjectionable on this account.

Intense mental emotion of any sort has long been known to cut short a paroxysm of asthma; and latterly psycho-therapeutics, in some form and degree of hypnotism, has been used with some success. This will hardly become a practical remedy; it can never come into general use, for probably neither the average patient will have it nor the average doctor be able to use it.

In the intervals of the paroxysms means should be sought to prevent recurrences; to this end the cause of them must be found and removed, if possible, and in a majority of cases this is possible. The personal susceptibility cannot be removed, but it can often by judicious measures be reduced in degree, so that the conditions of a wholesome environment will be incapable of producing an attack.

If the patient has had repeated attacks he has probably discovered what produces them, as some form of dust or odor, or some article of diet, or some physiological derangement. In such instances the proper treatment is obvious. Where the cause is not obvious a systematic and patient search is to be made for it. Every organ of the body must be studied in turn to ascertain if it is diseased, or if at the time of the attacks or just prior to each it is in a state of temporary irritation from any cause whatever. If any such disease or irritation is found, even if its coincidence with the seizures cannot be established, it should be dealt with as the possible cause. The removal or amelioration of some distant or apparently unimportant condition of this sort often cures the asthma promptly.

The irritation that oftenest will be found to cause asthma is within the nasal passages or in the naso-pharynx or pharynx. Whether polypi or inflammation, thickening of the tissues or ulceration, the disease should be corrected by surgical measures if necessary. Not every case of asthma will be cured by surgical treatment of these parts even when they are in a positive state of disease, nor should the patient be promised that it will; the polypus should, however, be extirpated and the inflammation treated, and the patient be glad of it, and glad if it also cures the asthma. It will almost certainly be found that cases of asthma that are coincident with nasal polypi are curable by removal of the tumors, especially if the latter are in the lower part of the nares.

The removal or correction of deflected septa and hypertrophied turbinates is less likely to cure asthma, but the probability is sufficient to warrant the measures necessary to correct them, especially if the asthmatic seizures are frequent and severe. The danger from the operation upon the nares in careful hands is slight, and the promise of relief considerable.

If no disease can be identified as a cause, a systematic search is to be made for it outside the body, and the atmosphere the patient breathes is the first object of study. Measures should be taken to ensure its relative purity and, as far as possible, freedom from dust and odors. Everything in the patient's room that could possibly contaminate the air should be removed, including carpets, drapery, all superfluous clothes, beds and pillows of feathers, every article of bed-furnishing that can send dust into the air by any movement of the bed. Of all the offensive dust-producing agencies in the homes of the people, the pillows and beds are unquestionably the worst, especially the pillows. There is not one feather pillow in a hundred in use, by even well-to-do people, out of which dust cannot be seen to gush if the pillow is suddenly squeezed or given a sharp blow. The beds are subject to the same indictment, only their dust is inspired less than that of the pillows. This dust is most irritating to many asthmatics, and is a potent cause of the night-attacks.

The pillows and bed had best be of hair freshly washed and clean, and the ticking and slips, the sheets and blankets (never quilts or comforters), must be washed often enough to ensure their freedom from dust and even odor. The floor of the room should be frequently washed and well dried or wiped with a damp cloth to remove dust, and the walls and ceiling may in some instances receive with benefit the last-named treatment, only less often.

Perfect ventilation should be had, which means manifold more fresh air for the room than the sick or well usually have. At least 1000 cubic feet of fresh air per person should be introduced into the room each hour, and there is no harm from a current of air over the patient's body if he is warmly clothed; he will not take cold. The dwelling of the patient should be examined and every evidence of decomposition within or about it, every cause of mustiness, be removed and its recurrence prevented. The asthmatic patient cannot escape from the bad odors and atmospheric contaminations of his neighbors; the winds will bring them from long distances. But the farther removed their source is, the more they are rendered harmless by dilution, while the mustiness from the cellars and hidden places of his own house he breathes in a concentrated form.

Then a study should be made of the dietary, to see if possibly any article of food or drink taken can be responsible for the attacks, and of the digestive organs as to their condition just prior to the seizures. Correction of diet and cure of disorders of digestion will often prevent attacks, especially if there is a tendency to gastric acidity and a disposition to eat too rapidly and too much, or there is alternating diarrhœa and constipation. These conditions often obtain in gouty and rheumatic patients. If any digestive disorder exists, it is

safe to suspect it as a cause until its correction fails to cure the asthma.

If no cause of the asthma can be discovered, and the practitioner is left to infer that probably a personal idiosyncrasy is responsible for it, he has left to him such measures as have been found empirically to be useful, and such as reduce the irritability of the nervous system.

Of the former, iodide of potassium is more valuable than all other remedies combined. In many cases it is a specific; as long as the patient takes even an occasional dose he escapes. After a course of it sometimes an immunity is enjoyed for a long time; on the other hand, sometimes after it has acted well for a time it loses its effect, and frequently it fails from the first. But among the cases where no cause of the attacks can be found it rarely fails to do some good for a time, and no case of this character should be regarded as incurable till this drug has been faithfully tried. It may be given in (adult) doses of 5 to 30 grains three or four times a day, always beginning with the minimum dose and increasing rather rapidly unless benefit results. No harm comes of the largest dose, and it may be taken many months if necessary. I have known patients to take one or two ten-grain doses each day for nearly a score of years with no apparent injury to health in any way. By this means they could escape the asthma; any attempt to do without the medicine was followed in a few days by a paroxysm. If the iodide of potassium disagrees, the iodide of sodium or the syrup of hydriodic acid should be tried before this form of medication is abandoned.

General alkaline treatment, by means of the bicarbonate of sodium or carbonate of potassium in the usual solutions or in alkaline mineral waters, helps some cases. Whether it is by correcting some digestive disorder or by counteracting a gouty or rheumatic diathesis it would be difficult to say, but the clinical fact gives support to the claim that asthma is in some instances a rheumatic symptom.

Something can be done to reinforce the nervous system and lessen its mobility in the direction of such reflex action as causes asthma. The measures to be resorted to are good hygiene, regulation of the general regimen, various tonic and alterative medicines, and such drugs as lessen nervous irritability, but never depressing agents to the nervous system.

It is by reinforcing the system that nux vomica, quinine, arsenical preparations, and other tonics have been found useful. They are useful in a proportion of cases, not uniformly so, and it is unlikely that any of them exercises a specific influence over the disease. Tonics should be used in small or moderate doses; large ones are liable to disturb the stomach and so increase the asthma. This is

especially true of arsenic, which should be given in the form of arsenate of sodium instead of arsenous acid or arsenite of potassium. The adult dose may be from $\frac{1}{30}$ to $\frac{1}{10}$ grain three or four times a day.

A few drugs probably tend to lessen the reflex irritability of the nervous system and reduce the tendency to paroxysms of asthma. In the so-called idiopathic cases, where the attacks are frequent and there is reason to suspect that the chief cause is the hyperæsthesia of the nerve-centres, atropine or some other form of belladonna may be used for a long time, and to the extent of keeping the patient up to the point of constitutional symptoms. The drug produces little or no depressing effect, and often wards off the asthma. One dose a day is enough, the quantity to be as required. But used in this way it is far inferior to iodide of potassium for the same class of cases. Stramonium preparations and hyoscyamus, valerian and the valerianates, quebracho, and grindelia are useful for the same purpose as the atropine. Grindelia especially has acquired quite a reputation, which seems not to be wholly deserved. The bromides are useful, but if given for a long time the doses should be small, and the sodium salt is the most eligible.

If in spite of treatment the asthma persists, some change in occupation, habits, or residence of the patient should be sought, or all together in succession if necessary. Change of occupation may so alter the environment and conditions of life as to eventually remove some undiscovered cause of the disease and lead to recovery; and it is regrettable that it cannot be oftener resorted to. Change of climate frequently stops asthma completely—just how, it is not easy to say. Victims in a low, moist climate should go to a higher region with drier air. For residents east of the Missouri River no region in the world is superior to Colorado and the country south and southwest of it, clear to the Pacific Ocean. Yet, there, some patients fail of benefit, and some helped for a while re-acquire the disorder. Moreover, cases do originate in that region, but the vast majority of patients migrating thither are benefited to some extent. Only a few, however, recover so completely as to be able to return permanently to their former homes without a recurrence, thus showing that there must have been some cause in the climate they left, either some dust or moisture or other contamination of the air, which they escaped in the new home.

Patients unable to remove to a distant State should make, if necessary, repeated experiments of slight changes in climate and residence. Often a little change will produce a marked effect—a move of a few blocks in a city or a few miles in the country, changing the altitude even a hundred feet; any change is justifiable, and the least promising may work a magical benefit.

BRONCHITIS.

Bronchitis naturally includes tracheitis, and thus is an inflammation of the mucous membrane from the larynx to the air-vesicles of the lungs. It is a very common form of disease, comes in every degree of severity that inflammation can have, from a common cold "on the lungs" to a mortal malady, and in duration from a short-lived attack of a few days to the lapse of several decades. It occurs most to the young and aged, but no age is exempt; and most in the colder climates and seasons—not so much in the lowest temperatures, when the moisture is mostly condensed out of the atmosphere, but in the moderately cold ones. It occurs idiopathically or independently of any other affection, and it is a complication or an accompaniment of many other diseases, especially tuberculosis and the zymotic fevers; probably it occurs more often in measles than any other disease: it is practically a constant symptom of this affection, and some cases of tuberculosis are only bronchitis. It occurs to some degree also by extension or otherwise from inflammation in the neighborhood of the bronchi, as from pleuritis and pneumonia. Bronchial catarrh, usually erroneously called bronchitis, often results from those diseases of the heart, liver, and other organs which cause disturbance of the circulation in the lungs.

Bronchitis attacks people who are housed more than those who live much out of doors, and those reduced in vigor are more likely to have it. It is usually a bilateral disease—it always is if due to general or systemic causes; but it may be unilateral from some circumscribed infection (as tuberculosis), some locally acting cause (as a foreign body inspired), or some congenital defect making a part unable to withstand the normal vicissitudes of respiration. It may be mainly confined to the trachea and larger bronchi, or to the smaller bronchi, or to the smallest of all, the so-called "capillary bronchitis." In each variety the inflammation shades off to the normal surfaces without any sharp lines, and it may begin in one of the parts named and extend to another or to all.

The inflammation involves the mucous membrane and the submucous tissue of the air-tubes, and in the severer chronic forms reaches the peribronchial tissues even, often producing marked and permanent changes in them, such as thickening and contraction, sometimes with dilatation of the medium-sized bronchi in places (bronchiectasis). Of course the contraction of peribronchial tissue to produce dilatation of tubes must be irregular, and be attended with weakening of the tube-walls; a circular one must cause narrowing of a tube. The lumen of the smaller tubes is, from inflammatory thickening, often decreased, causing obstruction in breathing, espe-

cially in expiration, which sometimes leads to emphysematous dilatation of the air-vesicles.

There is nearly always some effusion or deposit upon the mucous surface, which is more or less expectorated, the substance varying from a thin sero-mucus through all grades and conditions of mucoid substance to muco-pus, false membrane, and blood. Transparent mucus and fibrin become opalescent by long retention, and as the acute disease progresses toward recovery the phlegm grows thicker and more tenacious, as well as more opaque. The mucous surface may be excoriated in places, when there is frequently, if not generally, some pus produced. These broken surfaces may occur with trifling constitutional symptoms, and be the seat of tuberculous infection and the beginning of phthisis.

The forms and appearances of bronchitis are so variable and manifold, and so shade off into each other, that it is idle to try to make any accurate classification or one that will do more than form a working basis for study and treatment. Subdivision of the cases into acute, subacute, chronic, purulent, bronchorrhœal, and fibroid forms is useful, and not confusing if we understand that these terms are relative and descriptive, and only strictly applicable to a few typical cases.

It is not surprising that bronchitis is frequent when we consider the vicissitudes of atmospheric contamination and changes to which the bronchi are constantly exposed. The dust of every sort, animal, vegetable, and mineral, various irritating gases, and the products of animal life which we all inhale, especially in the wretchedly ventilated rooms, houses, and places of assembly where we congregate, produce most of the cases; the wonder is that they do not produce more. Such influences might be expected to tax severely so delicate a tissue as the bronchial mucous membrane to keep itself in a physiological state and rid its surface of irritants. The delicate cilia of the bronchial cells can only move the most minute particles, and easily become destroyed or disabled: then any foreign substance must be removed, if at all, by coughing, with or without the aid of mucus to entangle it, or by means of the lymphatics; and, as we all know, these agencies sometimes fail.

Lowered vitality of the system makes it easy for irritants and microorganisms to produce inflammation here as well as elsewhere, and they doubtless cause many cases of bronchitis, both localized and general. But localized bronchitis is due to other causes, as some congenital defect in a part or some peculiar arrangement of the bronchial branchings whereby some spot is embarrassed in its circulation and nutrition. An acute bronchitis recovers in the main, but at these spots the vitality is insufficient for this end, and a chronic inflammation continues, or

possibly the contiguity of some enlarged bronchial gland may lower the vitality of a spot by making the lymphatics unable to take away the irritating substances from these parts.

We usually assume that tuberculosis, which produces many cases of localized bronchitis, does not start in the bronchial surfaces without previous ulceration; but it probably often does, and there is much reason to think that sometimes the bacilli are brought to the part through the blood-current and not in the air, and find a culture-medium in the bronchial surfaces and lungs by reason of lower vitality in the particular spot. Tubercular bronchitis nearly always sooner or later involves the lungs.

Bronchitis is sometimes caused by inspiring foreign substances of tangible size—as contents of the stomach in the act of vomiting, or particles of food by a sudden inspiratory act in the midst of laughter while eating.

The most common cause of bronchitis is so-called cold-catching, a process the nature of which we are to a large extent ignorant of. To explain attacks of bronchitis on this theory is often to express our ignorance of its true etiology.

Poisons in the form of retained effete matter, ptomaïnes due to failure of action of excretory organs, must predispose to the disease, and there is in some a personal susceptibility in this direction that may itself be the result of some diathesis, gouty or rheumatic, or other cause that may be undemonstrable save by the effect of treatment. Moreover, retained excreta and ptomaïnes positively predispose to "colds."

The rate of mortality of bronchitis is not known, as the cases cannot be counted—a majority of them are never seen by a physician—but the rate is certainly low. Most of the deaths are in the young and in children, and from the form known as capillary bronchitis, but deaths are often wrongly attributed to it, since it is demonstrable that many are really due to lobular pneumonia, which often accompanies capillary bronchitis. Many times the bronchial inflammation is secondary to the pneumonia, yet the cases are called capillary bronchitis.

Chronic bronchitis by inducing emphysema finally wears out many patients; in a few it leads to tuberculosis, which destroys life; but it may last many years without greatly impairing the general health. The mortality from acute membranous bronchitis is high, perhaps 20 per cent., possibly higher.

Cough and expectoration are the most constant **symptoms** of bronchitis, and they present all degrees of severity and many variations in character. If there is much effusion upon the mucous membrane, there is always cough. This act, a single cough-phenomenon, consists in, first, a simultaneous firm closure of the glottis and increase of intra-

thoracic air-pressure by contraction of the chest and of the abdominal wall muscles, and then a sudden, complete opening of the glottis with a violent outrush of air, producing an explosive sound. The conservative purpose of cough is solely to expel offensive matter from the air-passages by this sudden outrush of air, but it is evident that its expulsive force is most effective in the smaller tubes, where a relatively large blast of air can be brought to bear against a little clump of foreign material. Masses of considerable size may rest on the walls of the larger tubes and trachea, and no ordinary coughing effort be sufficient to dislodge them, and a thin layer of effusion or other substance may cling to any of the surfaces and defy the cough to move it.

Cough is provoked by irritation of the nerves of the bronchi, and the causes of the irritation are several. One cause is foreign matter in the tubes, masses of mucus, pus, serum, or blood, or a mixture of them, with or without contamination by inspired air. Another cause is probably decomposition of these products, which provoke an irritation independent of their mere presence; another, and in many cases a nearly constant irritant, is the inflammation itself, which often makes a patient cough excessively without expectoration.

Cough is an erratic symptom: sometimes with severe inflammation there is little of it unless there is free secretion, while at others it is incessant with the most trifling degree of inflammation, leading to the suspicion that some diathetic state or a hyperæsthesia of the bronchial nerves or a reflex cause of some kind is responsible for it; and, again, cough results from the contact of the atmosphere upon markedly hyperæsthetic bronchial surfaces with little or no true inflammation—a state analogous to cutaneous prurigo. Cough is the result of a blind impulse of nature. The nerves cannot know whether the irritant they feel is a mass of mucus or pus that can be removed by a coughing effort, or a sore spot on a tracheal surface; the cough will result the same from each; a foreign body may be expectorated and the cough cease, but a cough from an irritated spot goes on and on.

In acute bronchitis there is frequent fever, rarely very high, unless there is some complication of lobular pneumonia or other disease. Very high fever should always suggest the possibility of an intercurrent disease, especially some essential fever or tuberculosis. Infection by ptomaïnes or otherwise may elevate the regulation point of temperature and so produce fever; it may also cause bronchitis, which itself may incorrectly appear to be the cause of the fever. It is regrettable that we do not know more definitely all the infection causes of fever, as well as the reasons why some cases of apparently severe bronchitis are not attended with fever, while others are.

As might be expected, the cases attended by fever have other constitutional symptoms—more depression, discomfort, anorexia, and digestive derangements, with high-colored, scanty urine—than afebrile cases do.

The more chronic forms rarely have fever, probably never unless there is some part of the diseased region where pus or pus-products of decomposition are retained and absorbed. If this occurs, localized tuberculosis may be suspected, but does not always exist, for in bronchiectasis there may be from some small area slow absorption of non-tuberculous morbid products that cause erratic fever of a low grade. Then there may be a rise of temperature each afternoon, half a degree to two degrees, and yet, if the patients can take good care of themselves, they may endure for years this light, almost daily fever, and suffer only a moderate reduction of their vital powers or of the body-weight.

There is rarely any true pain in the bronchi or in the chest in bronchitis. Often there is a sense of rawness along the trachea and perhaps in the larger bronchi, not infrequently located by the patient at the mid-sternum or below it, but rarely constant for more than a few hours, and then in the more acute cases; in the chronic ones there is commonly no pain or discomfort, but a trifling sense of constriction across the chest may be present. Most often of all may be a sense of tickling, itching, or titillation of the trachea or bronchi or in the larynx or pharynx and attributed to the passages below, and causing a disposition to cough that, because it does not bring up any phlegm, is called a dry or hacking cough.

In the croupous or membranous variety of bronchitis, usually an acute, rapidly developing disease, there is more constitutional disturbance, fever and all its accompaniments, perhaps from the general infection of the system by the cause of the false membrane. If the bronchial surface involved is large, there may be embarrassment of respiration and all the symptoms of profound sickness, and the danger of death is great. Even after numerous casts of the bronchi are coughed up the danger is not over, for the fever and prostration may continue some days. There is a rare, sharply localized recurring croupous bronchitis that is almost devoid of danger. The constitutional symptoms are mild or absent, and the seizure lasts perhaps a week, usually to the great solicitude of the patient.

Common acute bronchitis runs a course up to a limit of two weeks, but the febrile period is often not half as long. The expectoration of muco-pus may continue from a week to a month thereafter. In the acute stage, especially in a child and when the capillary tubes are involved, there may be extreme dyspnœa with cyanosis, and high fever with drowsiness. Then the prognosis is grave.

The diagnosis in bronchitis in all forms and degrees is not always so easy as it seems. It is confused with irritative, non-inflammatory cough, with lobar pneumonia (catarrhal pneumonia has always bronchitis as an accompaniment), with the bronchial congestion of organic heart disease, and with the bronchorrhœa of nephritis.

After the characteristic signs appear lobar pneumonia should be easily distinguished by these: high fever, bronchial breathing, high-pitched, prolonged expiration, perhaps crepitant râles, dulness on percussion, and rusty sputa. Examination of the heart should easily distinguish organic disease of this organ and whether it is the cause of increased vascular pressure in the lungs; if it is, then the pulmonary second sound is usually accentuated. In apparently pure tubercular bronchitis there is usually some thickening of the trabecular tissue of the lungs, which is shown at least by a slight increase of fremitus, a reduction of the vesicular murmur perhaps, and slight prolongation of the expiration; these signs, too, are often unilateral, or worse on one side, always suggestive of tuberculosis.

Many cases of slight non-tuberculous bronchitis must be diagnosed solely by the symptoms; there are no physical signs, save perhaps so slight an increase in the normal bronchial quality of the breathing as almost to escape detection. This is particularly the case with inflammation of the lower trachea and the larger tubes; there are no râles, and the bronchial breathing is so slight as to raise the doubt as to whether it may not be normal to the individual. Of course there is no change in the resonance, except trifling dulness at spots where there is lobular pneumonia; these spots are mostly not demonstrable, and usually in the chronic cases a slight degree of emphysema increases the resonance.

The laryngoscope reveals some redness in the acute cases, with swelling of the trachea and the bronchi at the bifurcation.

Every sort of râles and rhonchi is heard in bronchitis (except perhaps the crepitant ones), from the moist subcrepitant râles of capillary bronchitis to the coarse, dry rhonchi of the subacute and chronic forms. They are subject to much fluctuation from day to day, even from hour to hour, but in pure non-tubercular bronchitis they are usually bilateral. Râles that are persistently unilateral suggest either tuberculosis or localized pneumonia.

Treatment.

The proper treatment of bronchitis depends on the stage and character of the inflammation. Many patients are treated domestically with nothing but a variety of expectorants and with some irritating or warm applications to the chest. In many such cases

recovery is prompt enough and without the patients ceasing their daily duties.

For an acute case of any severity, especially if much fever is present, the most useful measure is recumbency in bed for a few days, two at least, and in a well-ventilated room. At the same time the patient should be so warmly clothed over his whole body as to keep him constantly on the verge of perspiration. Bed-clothes are not enough, for the arms are sure to be out of bed much of the time, and the shoulders need more warmth than any common night-gown supplies. A good addition to the bed-clothing is a sack, a jacket, or a nightingale (a piece of wool-flannel a yard wide and two yards long, covering the shoulders and arms and pinned at the neck and wrist), which prevents the chilling of the upper portion of the body. The night-gown should be made of wool. In this way rest in bed more powerfully aids in the restoration than any other treatment, for it reduces the exercise of the body to a minimum and gives the system, often lowered in vigor as the attacks come on, rest for recuperation; and it guards against temperature-changes, as well as other vicissitudes that might prolong the attack by keeping up the bronchial congestion.

By promptly resorting to this treatment, with the addition of an opiate—10 grains of Dover's powder or its equivalent—an attack of acute bronchitis may often be aborted and brought to an end in two days that otherwise might continue for weeks. There is some, but not great, reason to think that quinine given to the point of cinchonism aids in this consummation.

Hot poultices and other fomentations to the chest are popular in certain quarters, and are useful if they can be maintained at a high-enough temperature. But they require to be changed frequently; if allowed to become cold, they do positive harm, and in the act of changing them the body is exposed to the air and may be chilled. At best, they are only an article of clothing, and are not half so workable and convenient as a jacket made of thick cotton or wool; they are subject to more dangers in use than the latter, and are not a particle more useful. Nothing has shown more the value in acute bronchitis of warm clothing for the body than the good effect of these chest-dressings, and general clothing of the body as a whole is quite as valuable.

The patient should be cautiously and well fed with the most digestible food—should have the bowels kept free and take tonics, especially the bitter and stimulating ones. One grain of quinine and a sixtieth grain of strychnine every two to four hours, with some aromatic, and some small doses of alcoholic stimulant if the latter be allowable, constitute perhaps as useful a combination as any.

Anodynes in moderation are called for if there is much discomfort or excessive cough, or cough beyond the necessities of freeing the passages of phlegm. Codeine is one of the best; morphine or opium in some form, with ipecacuanha or tartar emetic for a slight expectorant effect, is perhaps next in value. Paregoric is an eligible quieting compound, and may profitably be given with syrup of ipecac and of squills, in equal parts. These anodynes should be used in the smallest doses capable of producing the desired effect, unless one full dose is given in the hope of aborting an attack. They should never be given to "stop the cough" so long as it brings up phlegm, but may be used to quiet an aggravating, useless cough. Opiates should be used with great caution in infants and children. A good combination for children who object to taking medicine is $\frac{1}{4}$ grain of morphine and 1 grain of tartar emetic in a gobletful of water, a teaspoonful being taken once in one to four hours according to the severity of the cough and distress. A child will rarely object to it, and each dose represents about $\frac{1}{250}$ and $\frac{1}{60}$ grain of the drugs respectively, which are safe.

Some of the expectorant drugs with anodynes are allowable when the cough is "dry;" they tend to cause a freer flow of mucus and serum, making a phlegm which the cough can easily expel. The most useful expectorants are ipecacuanha, squill, senega, sanguinaria, tartar emetic, and apomorphine, which should always be administered at first in minimum doses, to be increased if necessary, but there is no need of ever carrying them to the point of nausea. In my observation ipecac and tartar emetic stand first for acute, sthenic cases; apomorphine is much prized by some practitioners, but is less useful. Free expectoration has the advantage of carrying off particles of inhaled dust that may irritate the respiratory membranes, and may in some other manner, as it often seems to, still further relieve the irritation. But the indiscriminate use of anodyne expectorants in colds and coughs is mischievous, for they often impair the digestion, reduce the appetite, cause constipation, and stop or lessen a cough that is most salutary in removing offensive materials from the bronchi, and in these ways doubtless prolong many cases of bronchitis. The irritation of the bronchi that causes a dry cough may often be assuaged by inhaling steam from a vessel of boiling water. A little turpentine may sometimes be added to the water with benefit. Inhalations of pyridine are useful for this condition.

In the recovery from acute bronchitis warm clothing should be maintained, and a mild tonic treatment continued; overwork should be avoided lest it retard the recovery; good feeding, but not overfeeding, and perfect digestion are important.

In the capillary bronchitis in infants and children the treatment

with stimulating tonics, warm applications to the body, especially the chest, and perfect quiescence in bed should be insisted on. The anodynes may be used if necessary, but always with caution as to doses; nothing approaching narcotism is ever safe for a moment. The danger of giving too much medicine to these young patients, doses too large and too many, is one that every practitioner should guard against. Most such patients are overdosed.

The treatment of the more chronic forms of bronchitis requires special consideration. Here we have an inflammation of a lower order of activity than the acute, and one which for some reason tends to continue. The tendency of every inflammation of mucous membranes must be to recovery; yet here is one that often goes on for months and years. There must be some cause that directly keeps it up; it does not continue from total depravity of the tissues or the physiological processes.

The first rational step in treatment would be to remove the cause if possible. One of the causes is certainly irritating things inhaled, as dust of various kinds, and irritating gases, such as sometimes provoke attacks of asthma. It is possible that some persons have bronchial mucous membranes preternaturally sensitive to irritation. They acquire chronic bronchitis from the irritating properties of the atmosphere that to the average person produce no effect whatever. For perfect safety such patients require a selected and protected atmosphere to breathe. Better ventilation of rooms occupied by the patient at his work and in his home would do much to remove these injurious influences. This is the first and greatest step in the direction named, and perfect ventilation means the admission of an amazing amount of fresh air into the rooms constantly. If the occupation involves exposure to a great deal of irritating dust or gases, it should be abandoned for something less baneful.

A high degree of humidity of the atmosphere when cold—near the freezing-point—tends in some susceptible persons to produce or prolong the disease. Only a change of climate would completely eliminate this cause, but the patient can usually clothe himself in such a manner as to minify the effect of the damp cold. Chilling of the surface of the body is more harmful than the damp air, especially in a person below his normal standard of vigor, and such patients usually are feeble.

People in general are too fearful of feeling warm and of perspiring, and patients with chronic bronchitis need to learn to feel warm and insist on it at all times. They should sleep in woollen night-gowns winter and summer, and wear woollen underclothes during the day, and of as heavy weight as they can bear. If the wool irritates the skin, a thin silk or cotton or loosely woven linen garment may be

worn under it. At night the clothing should be so abundant that thorough room-ventilation may be allowed without harm. There will be no cold-taking if the body is warm, even if a draught of air is felt over the face, but a woollen night-cap may be required to complete the clothing.

Chest-protectors of leather or flannel are of value in some cases, especially where the clothing worn over the anterior chest-surface is thinner than that which covers the rest of the body; but except in such cases they are not as good as a uniform distribution of clothing. To keep the chest warm and allow the limbs to be cold cannot be expected to help a chronic bronchitis.

The evidence is considerable that the disease is sometimes prolonged, if not caused, by retained excreta, by some failure of depuration, or by some diathesis. Of the latter the rheumatic and gouty are just now coming to be held responsible for many symptoms not formerly suspected to have any connection with them. Neuralgic pains in various parts of the body, migraine, sore muscles, and various inflammations of mucous membranes are now attributed to retained uric acid or the rheumatic diathesis, and, it may be said, with good show of reason. This possibility should always be considered in chronic bronchitis, and if there is even a moderate probability of the existence of the gouty or rheumatic diathesis, the antidotal treatment should be tried; no harm can come to the patient from a few weeks' anti-lithæmic or anti-rheumatic treatment and much good may be done.

Organic heart disease, such as mitral regurgitation or obstructive lesions, causing distention of the bronchial vessels, always produces congestion of the mucous membrane and frequently cough, and if not actual inflammation it may at least prolong the latter. Measures to ease the load and to increase the strength of the heart are valuable; hence reduction of exercise, a careful life, free elimination, and the use of digitalis and strophanthus are in order.

Many cases of chronic bronchitis are greatly helped by medium doses, long continued, of iodides of sodium and potassium—just why it is impossible to say. This form of medication should always be tried in those cases not due to removable causes. General tonics should also be used for a long time if the system is below its standard, cod-liver oil and the Peruvian bark bitters being the best, but the latter should not be given in large doses. The arsenate of sodium in small doses ($\frac{1}{60}$ to $\frac{1}{30}$ grain), long continued, will help a proportion of such cases. Many practitioners have faith in a patient use of the various balsams taken internally in doses so moderate in size as not to disturb the stomach. Those especially to be mentioned are balsam of Peru, Canada balsam, and balsam of copaiba. The emulsion is a good form in which to take them. A protracted use of small doses

of some of the expectorants (without opium or its preparations) helps chronic cases sometimes, but if they interfere with the digestion and nutrition they should be abandoned at once. Inhalations of vapors of balsams, alteratives, and antiseptics, commended in this paper for bronchiectasis, are of some value in this class of cases, but to do much good they must be long continued, and patients often get tired of them or complain that they irritate and annoy rather than help. Where there is little expectoration and much cough the inhalation of pyridine may be used with benefit; it may soothe the irritation and produce a muco-serous exudation that is to a degree protective to the mucous surfaces and helps to carry off old and irritating accumulations.

For bronchorrhœa turpentine and terpine hydrate have been highly commended. They may be taken in small doses for a long time if they do not disturb the stomach. The balsams already referred to have some reputation for the same purpose, but of course no such specific medication is at all comparable to those measures that increase the vigor of the body and enhance its resisting power.

In bronchiectasis the aim should be to keep the bronchial cavities empty; especially is this important if the expectoration is fœtid, for it is reasonable to suppose that decomposition of the contents of a cavity will increase the irritation of its walls and prolong and aggravate the peribronchitis, if it does not keep the temperature elevated. Inhalations of various gaseous antiseptics have been used, but with small benefit. Iodide of ethyl 1 part, eucalyptol 1 part, alcohol or compound spirits of ether 6 or 8 parts, make a good inhalant, which may be respired from a sponge in a large-mouthed bottle, a few inspirations at a time, several times a day. The monochlor phenol, inhaled through a glass tube containing a small pledget of cotton saturated with the drug, does some good; its vapor is heavier than air, and hence would tend to remain in the lungs and prevent or retard decomposition. This drug is disagreeably malodorous. Sprays of diluted peroxide of hydrogen have been used, but it is doubtful that they reach the bronchiectatic cavities; they would readily prevent fœtor if they did.

If the cavities can be evacuated frequently, the fœtor is nearly sure to stop; the contents are retained because of gravity; hence inverting the body for a few minutes at a time, or changing its position so as to favor the outflow into large bronchi and the trachea, will often enable the patient to evacuate the accumulation, and he can perform the manœuvre at will.

The most useful treatment of very chronic bronchitis is change of climate, and life in the open air. Dry atmospheres are useful, as are high altitudes also in many cases. The greatest advantage comes from living in such places as favor out-door life at all seasons of the

year. The best climates of America for this purpose are those of Colorado, Southern California, New Mexico, and Arizona. These present every gradation of humidity from moderate (Southern California) to extreme dryness (Arizona), and all altitudes from sea-level or below it in the Colorado Desert in Southern California to seven thousand feet or more elevation in Arizona, Colorado, and New Mexico.

For many chronic patients who live in cities and breathe, as all such must, a contaminated and impure air both in and out of doors, it is quite impossible to effect a cure at home. A few months' residence in the climates and conditions named will generally produce a marked improvement if not a complete cure; several years of residence is much more useful.

The good effect of the climate is increased by frequent cool or cold baths, with brisk rubbing or massage to produce a glow of reaction. Many physicians claim that cold bathing will "toughen" people, especially children, and prevent recurrences of bronchitis. Living in the best climate is no reason for sleeping in a poorly ventilated room; the bronchitis patient must always and everywhere breathe the best air.

WHOOPING COUGH.

Whooping cough is a zymotic, doubtless microbic, disease affecting chiefly infants and children. It is self-limited, and is probably transmitted through the breath or sputum, or both, and renders its victim immune for a certain period from further attacks of the disease. It is characterized sometimes at first and temporarily by slight elevation of temperature, which soon subsides, and for a few days by all the symptoms of a moderately severe catarrh of the respiratory mucous membrane, sometimes of the eyes also, and especially by a common cough, which later becomes distinctly paroxysmal in character and lasts in this form usually from two to eight weeks. The fits of coughing occur at varying intervals of a few minutes to as many hours, and last from a few seconds to a minute or more, and are intense in the rapidity and force of the successive coughing efforts, and in the excess of the expiratory over the inspiratory efforts: the lungs are emptied of all that is possible of their residual air by several expiratory efforts in quick succession, after which, and when the fit appears to be mostly spent, there is a deep, long inspiratory effort, often against slight spasmodic closure of the glottis, and so producing a whooping sound, whence the name of disease is derived.

The patient often feels premonitory sensations of an approaching attack, and may clutch at something for support; during the fit his conjunctivæ are suffused, his face may be swollen and purple, eyes distinctly protruding, and the skin is moist with perspiration, while his whole aspect gives evidence of a profound muscular effort; and at the end of the paroxysm, if not in the midst of it, he may vomit freely.

The disease through all the later days of its course usually appears to be strictly a spasmodic nervous affection; there is no fever, and if vomiting is not so constant as to deprive the system of sufficient nourishment, not much weight is lost nor debility induced: between the paroxysms there is no cough at all nor special evidence of a cold or of bronchitis; and the patient goes about much like a well person, except for the fits of coughing, which are frequently provoked or precipitated by exercise, excitement, draughts of air, or by eating, and are nearly always worse at night, when these exciting causes cannot be operative.

There are no known lesions of the disease save the initial catarrh of the respiratory mucous membrane, and later slight irritation of the larynx, epiglottis, and trachea. The larynx is extremely sensitive to irritants of any kind. The micro-organism producing the disease has not yet been demonstrated with certainty, although two different ones at least have been thought to be the cause.

Deaths often occur from the disease in infants and very young children, rarely in older persons, and then almost wholly from complications. The most common cause is lowered vitality, due to the varying effects of severe and frequent paroxysms and the loss of meals by vomiting; and intercurrent diseases occur easily under such circumstances. One of the more common is bronchitis with catarrhal pneumonia, which is undoubtedly produced sometimes by the inspiration of particles of stomach-contents at the time of vomiting. But the automatic closing of the glottis which occurs at the end of many paroxysms is, although momentary, enough to prevent to a large degree the inspiration of food and mucus, and so is a conservative phenomenon. Another complication that destroys a proportion of infant patients is convulsions—an accident not to be surprised at when we consider the severe strain to which the circulatory apparatus of the cerebrum is subjected in the paroxysms of cough.

As a further result of the strain which the blood-vessels have to bear, occasional hæmorrhages occur, sometimes severe, from various mucous and serous membranes, as the nose, mouth, throat and stomach, bowels, and even the pia mater. Temporary blindness may occur.

The **prognosis** is bad in proportion as the fits of coughing are frequent and severe; frequent paroxysms with emesis and resulting poor nutrition, especially in delicate subjects (either from debility or

youth, speak for the gravity of the prognosis; infrequent paroxysms that do not or only rarely evacuate the stomach, in vigorous patients able to maintain their nutrition, speak for trifling danger.

The diagnosis is rarely difficult after the cough has become paroxysmal and the early catarrhal symptoms have subsided. Before this period cases resemble an ordinary cold or the influenza, and the diagnosis can often not be cleared up till the second stage of pertussis develops.

The cough of a paroxysmal character is the only symptom that is invariably present and noticeable. The whooping sound is occasionally absent, and may be present in other diseases, and the catarrhal symptoms at first may be so slight as to be denied by the patient. The spells of cough with tranquil intervals are never absent. Few other disturbances produce such paroxysms. There is such a thing as a nervous cough produced by other recondite irritants than the poison of whooping cough; it occurs more in adults than in children. Sometimes it appears to be due to ptomaïnes absorbed from the intestines, or to uræmia, or a rheumatic diathesis; sometimes to a moderate laryngeal irritation in a very nervous person; sometimes to foreign bodies inspired into the bronchi, as particles of food, which may produce occasional fits of coughing for many weeks. Generally, in all these conditions the cough has not quite the sharp, quick, incisive, spiteful character of that of pertussis, with the long, deep inspiration at the end of the fit and the calm that follows.

Whooping-cough patients should be isolated from other children as soon as a diagnosis is made; children who have never had the disease should be kept away from them. The act of some parents, on the assumption that their children must some time have the disease, and might as well have it one time as another, of knowingly permitting their exposure to it, is little less than a crime. Susceptibility decreases with the age, and if a child can be spared till his tenth year he is likely to escape through life, or if he does acquire the disease its dangers will be greatly reduced. All clothing used by or about the child, all utensils and fomites, should be disinfected by thorough boiling or by dry heat.

It is almost certain that a patient is capable of infecting others for at least a week or ten days after the paroxysms cease, and it is unfortunately probable that the infection is given before the paroxysmal character of the cough makes the diagnosis certain.

Treatment.

There is no specific treatment for whooping cough, since the etiology of the disease is unknown. Nevertheless, there are many useful things to be done which may increase the prospects of recovery. Of course the prime object of treatment is to lessen the

frequency and severity of the fits of coughing and to assuage the irritability of the upper air-passages.

As the disease is limited in duration, it is manifest that if the strength of the patient can be maintained and accidents can be avoided he will recover. To this end his nutrition must be kept up; if he vomits his food in the coughing spells, he should take a little easily digested or predigested food every hour or after each act of emesis. Some of the infant or invalid foods do very well, or, better, the expressed juice of slightly cooked fresh beef; a lemon-squeezer or a press of iron may be used to express the juice. Curdled eggs or raw eggs beaten up with milk or water constitute one of the best of all foods for such patients. If the patient will take them, four to eight eggs a day are not too much for a child of four years, in addition to two to six ounces of meat-juice, with perhaps other foods. If only a small part of this is absorbed, it will quite effectually prevent any loss of weight or any great loss of strength, but it will never do in a severe case to rely on the usual three meals a day; there would better be a dozen meal-times a day than three.

Tonics and stimulants are useful to the same end, and, if possible, should always be employed where depreciation of the vital powers is apparent. Strychnine and quinine are the best of all tonic medicines, but it is often difficult or impossible to give them to young children, owing to their bitterness. The taste can be covered to some degree by the syrup of coffee, liquorice, or chocolate, and occasionally a child can swallow a pill or capsule. It is not necessary to give large doses; the equivalent of an adult dose of $\frac{1}{40}$ grain of the former and 1 grain of the latter, according to the age of the child, and three or four doses a day, is enough. The tincture of the chloride of iron is useful, and may be given to almost any child in lemonade or milk. If vomiting occurs soon after a dose is taken, another should be given immediately. Alcoholic tonics are eligible or demanded in all cases of debility: they should not ordinarily be given in the milder cases. Children usually stoutly object to the odor of whiskey and brandy. When given these liquids should be diluted with six or eight times as much slightly sweetened water; this often removes the objection to their taste and smell. Deodorized alcohol (Cologne spirits) has very little odor, and may be given surreptitiously in water, milk, or lemonade to almost any child. It is an advantage, too, that only half the dose is necessary as compared with whiskey and brandy. It is difficult to say just what the daily dosage should be in a case; only enough should be given for a tonic effect; no stimulation above the physiological standard should be allowed, nor should any drug or stimulant be taken if it disturbs the stomach so as to impair its power of digestion or cause vomiting to be more frequent.

Something more can be done by various treatments to lessen the frequency and severity of the fits of coughing and to ward off complications, and almost countless drugs and measures have been invoked to this end. But if the strength, vigor, and weight of the patient can be maintained by the measures recommended above or otherwise, more is accomplished to lessen the discomfort from this disease and its mortality than if all other good influences combined are used to the neglect of these considerations.

The first step in this direction is to protect the child, if possible, from all influences that aggravate the disorder and precipitate attacks; hence, excitement must be avoided, and over-exercise, cold winds, and too much or too little clothing. The child should, in short, be guarded by as perfect hygienic conditions as possible, to the end that complications may be prevented and the body-vigor be kept at as high a standard as possible. Too much exercise and excitement are sure to lower the vital powers and increase the frequency and severity of the coughing fits; keeping the patient up to his most perfect standard of vigor lessens the number and force of them. He should be kept in well-ventilated rooms, and be so well clad in warm woollens that a slight draught will not harm him. Fear of draughts nearly always leads to poor ventilation, and an abundance of clothes is a good remedy. The night-clothes should be long and closed at the bottom in the form of pajamas or otherwise, to prevent the child from kicking himself naked.

The tonics already recommended lessen the tendency to the occurrence of paroxysms by reinforcing the nervous system, and quinine has some reputation for markedly reducing the cough, when taken in liberal—that is, cinchonizing—doses. Used in this way, it is one of the most useful of all drugs. It cannot be continued in such doses throughout the sickness if this lasts several weeks, but it may be given to the verge of cinchonism, and kept just short of it as long as the disease lasts, provided it seems to do good and does not disturb the stomach or make the head ache, for it may cause the latter without the tinnitus of cinchonism.

As the chief symptoms of pertussis are nervous in character, it is natural that the profession should have sought to cure or abbreviate the disease by measures addressed to the nervous system. To lessen the nervous irritability seems a prime desideratum, and almost every drug having any reputation for this purpose has been used at one time or another. Some dozens of them have been lauded as efficacious by their respective advocates, to be condemned as useless by others more sceptical who have tried them. It were a waste of space to recount all this testimony, for it is evident that much of it that is favorable has been given on insufficient observation in too few cases, and prob-

ably some of the adverse evidence is no better. One thing is clear—namely, that no anodyne drug should be used, except under the stress of some emergency, if it disturbs the digestion or interferes with the nutritive functions or the powers of life. Hence, opium and all its preparations and derivatives are objectionable, although they do sometimes temporarily reduce the paroxysms, and perhaps vomiting also. They should be used only when a strictly temporary effect is required, and then in minimum doses, and the safest preparation of the list is codeine or some of its salts.

The coal-tar products, antipyrin, acetanilid, phenacetin, and others, have been employed with temporary benefit, but their use through the weeks of the course of the disease, in doses sufficient to temper the symptoms, is certainly likely to lower the vitality enough to counteract their good effects. Of them all, antipyrin seems to be the best, and may be given in the dose of 5–10 grains (for an adult), repeated several times a day in cases demanding it.

Little treatment is required during the catarrhal period. If the cough and catarrh are excessive, a weak mixture of morphine and tartar emetic may be used very cautiously, as recommended in the section on Bronchitis. Any child will take it readily, and disagreeable mixtures are not called for. The trifling fever never requires treatment, and the use of so-called "fever mixtures" containing aconite are somewhat worse than useless. The bowels should not be allowed to be constipated, and laxatives may be needed, the best for children being calomel or castor oil.

If the patient is restless and wakeful, a little bromide of sodium or antipyrin, sulfonal, or trional may be given.

For the paroxysms, musk, valerian, asafœtida, and this class of stimulating anodynes are rational, but cannot do a great deal of good, and are offensive to children.

The most rational class of drugs consists of the compounds of bromine, the bromides, hydrobromic acid, and bromoform, and they must be given continuously for many days. The effect of these is to lessen the irritability of the nerve-centres, and so if possible to decrease the paroxysms. While good effects might be expected from this entire class, only the bromoform has acquired any marked reputation in this disease; and as to this there are very conflicting claims and testimony. Some insist that it is a sort of specific, and always cuts short the disease or lessens the severity and frequency of the attacks; others as stoutly declare that it produces no perceptible effect whatever. Probably the truth lies between them: the drug is not a specific, but it does mitigate the severity of the disease, and by virtue of its bromine, and any other form of bromine used as faithfully might be expected to do nearly as well.

Bromoform is an oily liquid, and may be given from 1 to 8 drops at a dose, depending upon the age of the child, in a drachm or two of water (with which it does not mix). Three to six doses may be given a day, according to the severity of the disease. Children take the drug well enough, but it is decomposed by the daylight and therefore must be kept in the dark.

If in spite of the treatment the sleep is greatly disturbed by the cough, hydrate of chloral is eligible; it both quiets the cough and induces sleep; but the smallest dose capable of accomplishing the purpose should be used. If convulsions occur or are threatened, this is the most useful drug of all.

Belladonna was once in high favor for quieting the irritability of the nervous system, and it deserves to be more often employed. It has the advantage of being safe in doses sufficient to produce its constitutional effects, and should be continued throughout the sickness. Atropine is the most reliable preparation, and should be given in the (adult) dose of $\frac{1}{200}$ grain, repeated often enough and in increasing doses, if necessary, to produce very slight dryness of the throat and possibly a little flushing of the face.

In cases of great prostration and evident overstrain of the heart with dilatation digitalis is useful.

Chloroform may be wisely given by inhalation in extreme cases where it seems imperatively necessary to cut short the individual paroxysms. But only an experienced and careful nurse should be entrusted with its administration. A few drops on a cloth held to the nose the instant a paroxysm is imminent will stop or lessen it, provided one or two full inspirations can be taken before the attack is fully under way.

Local treatments to the throat, larynx, trachea, and nasal passages have been much used, and have consisted of powders insufflated, solutions applied to the throat or sprayed into the passages, and various vapors inhaled.

Of powders, quinine, bismuth salicylate, benzoin, and boric acid have been used, all greatly diluted with some inert substance, as acacia or sugar of milk. They have done some good, but are hardly to be recommended for children, who generally are frightened by them. Probably the best among them is quinine in the proportion of 5 to 10 parts of the hydrochlorate to 10 parts of bicarbonate of sodium and 100 parts of gum arabic, of which a few grains may be used two or three times a day for insufflation into the throat. Good results from the use of these insufflations into the nose are reported.

Among the sprays of value are carbolic-acid solutions ($\frac{1}{5}$ to 1 per cent.), tannin, and bichloride of mercury (1 : 2000 parts). The carbolic acid spray is useful and safe, provided the patient will submit

to it without a struggle. Cocaine solution (2 to 5 per cent.) may be applied to the throat with a brush, but it should be used with great caution and only in an emergency.

Of the inhalations, probably very weak sulphurous acid gas, produced by burning a minute quantity of sulphur in the room, the vapor of the oil of eucalyptus, and the vapor of impure carbolic acid, thrown into the air by the heat of a lamp, are the best of all. The last fulfils the same purpose as the spray of carbolic acid, and is less disagreeable to the patient. The air of the room may be slightly charged with it constantly.

PLEURAL EFFUSION AND EMPYEMA; ABSCESS AND GANGRENE OF THE LUNG.

By A. J. McCOSH, M.D.

PLEURISY WITH EFFUSION.

Etiology.[1]—In considering the etiology of pleurisy with effusion there is a growing tendency to abandon the time-honored classification of pleural inflammation into primary and secondary—the "primary" pleurisies being those brought about through a more or less protracted exposure to cold or else being rheumatic in origin (the *pleuritis a frigore* of the older books); the "secondary" pleurisies being those resulting secondarily from all other causes. If we do not as yet feel disposed to give up this classification entirely, we are at any rate inclined to markedly restrict the number of cases of pleurisy which are to be placed under the first heading.

The reason for this increasing tendency to credit more and more of these so-called "primary" pleurisies to other causes lies in the fact that a careful consideration of the pathological anatomy of these cases, and especially of their subsequent history, has brought out in an unmistakable way a tubercular factor in a large proportion of them. That "exposure to cold," however, is the determining factor in many instances cannot be denied, just as in cases of pneumonia that element often seems to be the exciting cause. Other conditions, however, which are considered necessary for the complete evolution of the lesion, are also present. It must also be borne in mind that a perfectly clear-cut line of differentiation between the dry and the sero-fibrinous forms of pleurisy cannot be clinically made, the existence of small amounts of pleural effusion (following upon a so-called "dry pleurisy") being often unrecognized even by the trained ear, and the introduction of the needle for diagnosis being therefore omitted.

In the present state of our knowledge upon the subject we may

[1] Although the subject of Pleurisy is considered by Dr. Herrick in his article on Pneumonia and Pleurisy, the Editor has thought it best to include in the article of Dr. McCosh on Pleural Effusion such statements as he has to make regarding the etiology of this affection, since the surgical treatment depends largely upon the underlying cause of the effusion.

say that we recognize as etiological factors in the production of pleurisies with effusion the following:

Exposure to Cold, Dampness, etc.—The exact way in which this more and more discredited "primary" factor may bring about a state of inflammation in the pleural membrane is not at all settled. The possibility of an actual lowering of temperature of the pleural membrane itself resulting in a corresponding inflammatory reaction on its part, being ruled out by the physiological conditions prevailing in the chest, we are driven to the theory of a reflex vasomotor disturbance caused by the effect of the cold on the surface of the body, and its determination to the pleural in preference to other tissues.

As mentioned above, the cases of this kind are becoming less and less frequent as more researches are made into their subsequent behavior, many showing at a later period a tubercular element. In this connection, however, it should also be borne in mind that we may allow ourselves to be carried too far in this direction and to include under the head of tubercular pleurisies those cases in whom a subsequent tubercular behavior may well be the result of some tubercular infection of a lung already damaged by a primary pleural lesion—certainly a perfectly plausible assumption.

The exact position which "exposure to cold" will finally occupy as a primary etiological factor in the production of pleurisies cannot be defined at present, for it may well be that a primary inflammation from some form of bacterium as yet unrecognized may occur in a previously healthy pleura, which then becomes still further infected from some neighboring tubercular lesion, either by direct contact or through the lymphatic channels.

We do not wish to rule out completely "exposure to cold" as an etiological factor in pleurisies; for the facts that these diseases are more frequent in the winter months and that men are more often affected than women compel us to believe that cold certainly bears some relation to the production of the inflammatory process.

Rheumatism.—It is known that rheumatic and gouty patients are rather prone to attacks of pleurisy of varying degrees of severity. Many of the milder cases doubtless escape observation, for unlike the serous membranes in the joints, the pleural membranes cease to be the seat of acute pain as soon as their surfaces become separated by even a small amount of fluid.

As to the actual etiological factor or factors in the so-called "rheumatic" cases we are of course as much in the dark as we are concerning the primary cause of rheumatism itself. Some clinicians are inclined to believe that many of the hitherto so-called "primary pleurisies" are in reality rheumatic in origin (especially when existing on both sides of the chest), even if no other part of the body

present at the same time any evidence of rheumatic disturbance. It is not at all unlikely that many of these "rheumatic" cases may at a later period be classified under other heads, for as yet there has been little if any bacteriological work done upon them.

Tuberculosis.—As will be readily seen from the perusal of the statements just made, the exact limit which should be accorded to tuberculosis as an etiological factor in pleurisies with effusion cannot be positively stated at present. As the result, however, of a large number of careful investigations into the many recorded cases, it can be affirmed that the tubercular factor is an extremely frequent and important one, especially among adults. Some still hold the view that the tubercular pleurisies are not as frequent as is generally stated, and in support point to the many cases of pleurisy with effusion which heal up completely after proper procedures have been carried out. This fact, however, may not prove the absence of the tubercular element, for there are records of numerous cases of tubercular peritonitis which have healed up completely after operative interference.

The tendency to swing into the column of "tubercular" pleurisies almost all those cases of pleurisy which were formerly classified under primary pleurisies *a frigore* has arisen, as has already been stated, not so much from the microscopical findings, cultures, and inoculation results of the exudate, as from their subsequent unmistakably tubercular behavior.

Various authors give various percentages of so-called primary pleurisies which have later on developed tuberculosis. Enough cases, however, have been collected to prove that many of these were undoubtedly tubercular from the start.

The starting-point in these tubercular pleurisies may be from—(*a*) Tubercular bronchial glands. (*b*) Some small, perhaps unrecognized tubercular lesion in the vicinity of the pleura, as a tubercular focus in the lungs, or in the ribs, or in any of the bony structures adjacent to the thoracic cavity, as in the spine, sternum, etc. (*c*) A tubercular focus anywhere in the body, and the smaller and more remote the focus the less chance will there be of its being discovered and brought into etiological relation with the secondary pleurisy.

The most common way in which these tubercular pleurisies occur is undoubtedly by the extension of a neighboring tubercular focus in the lung itself to the pleural layer; the more or less rapid breaking down of that focus being succeeded by the infection of the pleura. The resulting exudate will be either clear or tinged with blood, the latter being the result of a slight hæmorrhage from the ulcerated tubercular focus or from the intensely hyperæmic pleural membrane in its first stage of congestion.

The microscope does not as a rule find the tubercle bacilli in the

pleural effusion unless some tubercular lesion has broken down and discharged its contents into the pleural cavity. The fluid, though apparently sterile, will, when injected into healthy guinea-pigs, produce tubercular inflammation in a certain number of cases.

Traumatism.—This is a not infrequent cause of pleurisy with effusion. As a rule, however, the inflammation or rather hyperæmia, does not proceed beyond the formation of a fibrinous or slightly serofibrinous exudate unless some septic element be introduced. Thus we see that many patients even with extensive fractures of the ribs escape with a comparatively slight pleurisy at or near the site of the fractures, whereas an infected compound fracture in the same locality will be followed by the formation of a liquid exudate which will subsequently become purulent.

If there be a traumatic lesion of the thoracic duct true chyle may be found in the effusion. This must not, however, be confounded with the fluid obtained in pleurisies associated with either cancerous or tubercular processes of the pleura, the latter containing broken-down leucocytes, epithelial cells, crystals of cholesterin, etc., whereas the former is seen under the microscope to consist simply of a fat emulsion, the chyle itself.

Sepsis is a common cause of pleurisy with effusion. The lymphatics of the pleura are very prone to transmit any septic element from surrounding or even remote foci. Thus we find a pleural exudate forming from an osteomyelitic process in some one of the long bones of the body as well as from an abscess in a more immediate neighborhood, as that of the chest-wall.

An acute axillary adenitis is not uncommonly followed by a septic pleurisy, the starting-point having been perhaps some apparently insignificant wound of the fingers, hand, or forearm, the lymphatic glands having failed to completely arrest the progress of the germs on their march along the lymphatic route. In a similar way an ulcerating process in a carcinoma of the breast is often followed by a pleural exudate.

Septic processes in the abdominal cavity form a frequent source of pleural effusion, the lymphatics of the pleura communicating freely with those of the peritoneum by means of the lymphatic vessels in the diaphragm. Thus septic processes in the subphrenium are particularly prone to infect the pleura at an early date, such as abscesses of the liver, breaking-down carcinomatous masses about the stomach, or perforating gastric ulcers, echinococcus cysts of the liver; or the infection may come from a still more remote source, an appendiceal abscess.

The pleural exudate may represent the result not of the transmission to it of the germs by the lymphatics from a local septic focus in the vicinity or at a distance, but rather the transmission to it of

germs by the blood in the course of a general septicæmia, all the serous membranes sharing, perhaps, alike in the process. This condition is found in the so-called septico-pyæmic cases.

Among the septic pleurisies we may perhaps place with propriety those pleurisies arising from influenza, though the specific germ has not been found and isolated in all cases. We may also place under this heading those pleurisies which result from septic processes of the tonsils or other tissues, and those occurring with the various exanthemata, measles, scarlet fever, and with whooping cough, typhus fever, retro-pharyngeal abscess, etc. In the exanthemata the poison is doubtless conveyed by the blood. Here also may be included those pleurisies arising as the result of the typhoid bacillus.

The Direct Extension of a Neighboring Inflammatory Process.—Many of the sources of this kind have already been mentioned in the previous paragraphs. Such an extension to the pleural membranes almost always occurs in a pneumonia, the amount of effusion between the layers of the pleura varying, of course, with the intensity of the pneumonic process. In these cases in the aspirated fluid are found—Fränkel's diplococcus; the staphylococcus pyogenes, or the streptococcus, or the fluid may be sterile.

As will be seen later when speaking of empyema, most of these meta-pneumonic pleurisies occur in children.

The inflamed pericardium may be the starting-point of a pleurisy by extension. This is rather the rule, for a certain amount of pleurisy is found to exist in every case of pericarditis.

Syphilis.—This disease seems to be a cause in certain cases. It is certainly uncommon in this country as a sole and distinct etiological factor. French authors specially describe a "secondary" and a "tertiary" form—the secondary form occurring seemingly as a part of a general infection, the tertiary one rather as a pleurisy by extension from some neighboring tertiary lesion.

Endocarditis; Nephritis; Cirrhosis.—As a rule the fluid accumulated in these cases is rather a serous transudation into the pleural cavity due to a local *venous stasis*, and represents a general dropsy. This dropsical fluid contains a smaller amount of albumin and is therefore less coagulable. The transudation is usually bilateral—the amount in each chest, however, oftentimes varying considerably. A similar venous stasis may exist from the pressure of tumors in the vicinity, as of the mediastinal glands.

Changes in the composition of the blood may also give rise to this serous transudation.

Pneumothorax.—The presence of air in the pleural cavity may act as the exciting factor and a sero-fibrinous exudate result.

Tumors of the Pleura.—The small fibromata which are not

uncommonly seen in the pleura do not appear to excite the pleura to inflammation by their presence. This is not the case, however, with malignant tumors, which usually occur from—(*a*) Direct extension of similar tumors of the lungs (these lung-tumors being themselves often secondary to similar tumors elsewhere). (*b*) Metastatic nodules from malignant tumors of other organs (*e. g.* carcinoma mammæ, osteo-sarcoma of femur, etc.). (*c*) Some are primary new growths; such are endothelial carcinomata, which are rare. (*d*) Parasitic growths such as echinococcus and actinomycosis. In the latter the tendency is to adhesions rather than fluid.

Hemorrhagic infarction of the lung—often occurring from the plugging of a terminal pulmonary arteriole. The inflammation is therefore a cortical one and the pleura is soon invaded.

Abscess and Gangrene of the Lung.—The cases occurring from these causes may be due either to sepsis or to invasion by extension through the lung-tissue. A *distinction* should be made between—(*a*) A blood-effusion into the pleural cavity (hæmato-thorax) and (*b*) Pleurisy associated with a blood-tinged exudation.

(*a*) In *hæmato-thorax* the etiological factors are—(1) Traumatism, as from fracture of ribs, where the pleura and even the lungs may be lacerated and the blood comes from a ruptured vessel. (2) The bursting of a blood-vessel in the neighborhood, such as an aneurism of the aorta or from a vessel in a carcinomatous or sarcomatous tumor, the tumor, however, not having encroached sufficiently on the pleura to cause an exudate. (3) The pressure of a tumor on the large intrathoracic veins.

(*b*) As causes of the *blood-tinged exudation* in a pleurisy with effusion may be mentioned—(1) The ulceration of the walls of a blood-vessel in or near the pleura in an ulcerating tubercular lesion. (2) The hyperæmic condition of the blood-vessels in the pleural membrane in cases of intense congestion at the outset of the inflammation. (3) Septic disease as a result of the embolic affections of the lungs. (4) Cases of scurvy and of purpura hæmorrhagica. (5) The general hæmorrhagic diathesis (when associated with pleurisy with effusion). (6) Pernicious anæmia and leukæmia.

Treatment.

The treatment of pleurisy is practically the same as was so fully and clearly described in Volume II. It will not be amiss, however, to add what has been learned by the experience of the past five years.

Medical Treatment.—It is important if possible to ascertain the cause of the pleurisy and direct our attention toward its removal. For example, in rheumatic subjects the administration of anti-rheumatic medicines such as sodium salicylate, oil of wintergreen, or salophen is indicated. In addition to treatment of the cause, rest

in bed, fluid diet, and strapping of the chest, and perhaps tincture of aconite should be employed in the acute stage before the effusion has appeared. In regard to counter-irritation opinions differ and will continue to differ.

In the *stage of effusion* the two indications are for depletion and aspiration of the fluid.

Depletion.—The dry diet seems to be more useful in restraining the exudate than does the fluid diet. The amount of fluids drunk should be restricted as much as possible. If fever is absent or only slight, a diet of meat, dry bread, and eggs should be employed, with a limitation of the fluid to eight or ten ounces in the twenty-four hours. Every morning an hour before breakfast a saline cathartic, as half an ounce of Epsom salts, should be given. The urine should be watched, and, if scanty, diuretics such as the potash salts may be given with advantage. The skin must also be kept active. Other indications must be met by appropriate remedies.

Aspiration.—It was formerly the custom not to aspirate as long as fever was present unless pressure-symptoms were marked. It was also formerly the custom to wait at least three weeks before removing any of the fluid. Modern practice, however, is not influenced by those considerations and aspiration is now employed irrespective of fever and irrespective of any certain duration of the disease. Thoracentesis is always indicated—

(*a*) When the fluid is sufficient to cause dyspnœa.

(*b*) When the fluid reaches as high as the third rib, whether or not there be symptoms of pressure.

(*c*) When the heart is displaced by the pressure of the fluid.

(*d*) When the fluid resists absorption for longer than two weeks in spite of medical treatment.

Another indication which is observed by many physicians, but which is not absolute, is to aspirate when the level of the fluid rises above the angle of the scapula.

As already stated, fever should not be considered a contraindication to aspiration. Not infrequently after removal of a part of the exudate the temperature will at once fall never to rise again.

The old idea that aspiration occasionally caused the conversion of a clear effusion into a purulent one is at the present day abandoned. Possibly in former times an unclean needle or syringe may have produced such a result, but at the present time such an accident would be inexcusable and any fear of it may be dismissed from our minds.

The advantages of early aspiration are that adhesions may be prevented and the course of the disease shortened. This latter is especially true in regard to children, in whom rapid cure is apt to follow a single aspiration.

The *diagnosis* of pleurisy is not complete without the use of the exploratory puncture. With ordinary caution this should be absolutely harmless. An ordinary hypodermic syringe is not well adapted for this purpose. The needle is too short and of too small a calibre, and the great difficulty of disinfecting a leather piston should exclude the use of this instrument. There is but little excuse for its employment when so many syringes capable of sterilization can be found. It must be mentioned, however, that until recently it has been difficult to find a syringe possessing a good power of suction and at the same time capable of sterilization by boiling. A variety of syringes can, however, now be recommended for this purpose. The piston of some is made of asbestos; the best of these are the Overlach and Meyer instruments. In the larger syringes, however, the asbestos is apt to flake off. A better instrument, which is made of any dimension, is the syringe of Baumgartel, in which the piston is made of linoleum. An admirable syringe is that invented by Wülfling Lüer, consisting of a smooth rod of glass within a glass cylinder. Serviceable instruments are now being constructed in this country in some of which a solid metal rod acts as a piston, in others the piston being made of rubber.

It is of the utmost importance that the skin be carefully disinfected before the puncture is made. A thorough scrubbing with green soap followed by alcohol, ether, and bichloride solution should invariably be made. The syringe should be removed with sterilized hands from the vessel in which it has been boiled in a soda solution. The needle should not be plunged in, as is sometimes directed, but it should be slowly and steadily pushed through the chest-wall until by the free oscillation of its point it can be determined that a cavity has been entered. This is generally at the depth of about two inches. The needle used for this purpose should be at least three inches in length.

Should the ordinary hypodermic syringe be used, a prior disinfection must be done by soaking it for at least twenty minutes in a solution of carbolic acid, 1 to 20. When removed from this by sterile hands it is not ready for use until it has been washed out with *sterile* water, for as a rule a culture should be obtained from the fluid withdrawn by the syringe, and enough of the carbolic will remain to destroy the germs in the fluid.

The diagnosis having been made and thoracentesis being indicated, the aspiration can be made by one or other of the aspirating syringes described in Vol. II. The instrument, however, should invariably be tested before the needle is introduced. There is no better instrument than the ordinary Dieulafoy aspirating syringe with double stop-cocks. The needle used should have a diameter of at least 1 mm. and be at least three and a half inches in length. The whole apparatus must be carefully sterilized before use.

The use of the trocar and canula has been abandoned as unsatisfactory.

The *amount of fluid withdrawn* must be regulated by the condition of the patient, but the chest should never be entirely emptied, even were this possible. The needle should be withdrawn at once when cough begins, or when the patient experiences dyspnœa or faintness, or when the heart's action becomes weak or irregular.

If during the aspiration the needle becomes plugged by clots of fibrin a sterile stylet should be inserted through the needle. If this fails to clear away the obstruction fluid should never be syringed back through the needle, but the needle should be removed and inserted at some other point.

After use the syringe and all its attachments should be thoroughly cleansed with hot soda solution.

Frequently, especially in children, a single aspiration will be at once followed by improvement which will continue. A second or even a third aspiration may be needed, and even then the fluid may re-accumulate. In such cases when the pleurisy may be said to be chronic the indications are for a free incision and drainage, the details of which are discussed under Empyema. Of course, in hydrothorax that is due to chronic heart- and kidney-disease these remarks do not apply, as in such cases repeated aspirations must be employed until the original disease has either been cured or has ended fatally.

Empyema.

Etiology.—For the production of an empyema the pus-producing microbes must be present. The inflammation (*a*) may be purulent from the start, or (*b*) a pleurisy with effusion may be converted into an empyema by the addition of the pyogenic bacteria.

The pus in empyema is not made up simply from the white blood-cells which have come through the walls of the blood-vessels by diapedesis, for their numbers are far too great for that to be possible. These cells undoubtedly subdivide rapidly after escape from the blood-vessels.

In enumerating the etiological factors of empyema we cannot do better than to say that they are much the same as those mentioned under pleurisy with effusion, the empyema being simply a further stage in the same process, whether the pus be produced from the start as a result of infection with pyogenic organisms or whether it be due to a later infection engrafted on a sero-fibrinous exudation.

The germs found are—Diplococcus pneumoniæ (Fränkel's). Streptococcus pyogenes. Staphylococcus pyogenes aureus. Tubercle bacillus. Typhoid bacillus. Colon bacillus. (A few others in rare cases.)

Diplococcus Pneumoniæ (*Fränkel's*).—This germ is found in a large

proportion of meta-pneumonic empyemata. Most of the purulent pleurisies in children (about 75 per cent.) are meta-pneumonic. This germ is short-lived and is not very virulent, hence most of the empyemas in children are more easily cured than is empyema in adults. It is found in a certain number of cases of empyema where no lung-lesion can be discovered. This does not, however, rule out absolutely the evidence of a previous pneumonic process, for in children—a class in which a large proportion of these cases are found—a central pneumonic process not easily diagnosed often occurs. This has doubtless been the case in many of the patients above referred to, and the presence of the pneumococcus is the only guide to the etiological factor. The exact route taken by this germ on its way to the pleura has not as yet been clearly proven; the lymphatics, the lung-tissue, or the blood-current may be the route chosen. There is nothing unreasonable in the assertion that the germ may travel into the pleura and there set up a pleurisy without causing any pneumonia along its path. The pleural membranes may happen to be a more suitable soil for its development at that time than is the pulmonary tissue.

This bacillus is found in about one-third of all cases of empyema. It often, but not invariably, produces a thick, viscid pus of greenish tinge.

Streptococcus Pyogenes.—This germ is found in about one-half of all cases of empyemata in adults. The streptococcal empyemata are clinically of much more severe type than the pneumococcal. The influenza cases seem to come under this group where the streptococcus is found in the pus. When the germ exists in the purulent fluid it has probably in many cases been carried to the pleura from a primary focus in some other part in the body. This primary focus may well be overlooked, especially if it be small and in the lungs. As a starting-point for the germ, some one of the various lesions mentioned as etiological factors in pleurisy with effusion may sometimes be discovered if the patient is carefully examined.

This germ is found as the chief factor in certain pneumonias following the infective diseases. In many cases this is doubtless the source from which it enters the pleural cavity.

Staphylococcus.—A few cases are recorded where this germ was found in pure cultures of the pus. As a rule, however, it is found together with other germs, so that we cannot at present definitely gauge its exact etiological importance. Usually in such cases the other forms of associated bacteria determine the quality of the inflammation and the properties of the purulent fluid. This germ also, doubtless, comes from the lungs, as we find it there in some cases of lobar and of broncho-pneumonia.

It was formerly supposed, when a previously clear pleural effusion

became purulent as the result of aspiration, whether for diagnosis or for treatment, that this effusion had been infected either directly from the needle or from the germs in the air reaching the pleural cavity through the wound. We know now that while this may of course occur, still a certain number of these effusions will become purulent if left to themselves. The pyogenic germs doubtless reach the fluid either through the inspired air or through the blood-current. The danger of infecting the pleural exudate even when an unclean needle is used is not very great, as usually the exudate possesses sufficient germicidal properties to destroy a small number of germs.

Bacillus Tuberculosis.—While this germ figures strikingly as the etiological factor in a large percentage of pleurisies with effusion, we know that it is found in but a small percentage of all cases of empyema. While the germ, however, is *found* microscopically only in a few cases, the results of inoculation experiments prove that apparently sterile exudates are in reality tubercular. At the present time the withdrawal of absolutely sterile fluid from an empyema places the case clinically among the tubercular ones.

The tubercular cases are usually chronic, resulting in great pleural thickening which under the microscope shows typical tubercular inflammation. The pus is often thin, and may be streaked with blood, and is rather grayish as distinguished from the green pus of the metapneumonic cases.

For the sake of completeness may be mentioned as occasional factors—(*a*) The *encapsulated bacillus of Friedländer*, and (*b*) The *typhoid bacillus*. The inflammation set up by the typhoid bacillus is more apt to be a pleurisy with effusion, which may well become infected at a later period by one of the other micro-organisms from some septic focus elsewhere in the body.

The Saprogenic Microbes.—These are the microbes which add to the effusion the element of putridity or gangrene. Among them we note *Löffler's bacillus; Bacillus coli communis; Leptothrix.*

A gangrenous pleurisy may be either gangrenous from the start or the gangrenous element may be added secondarily and determine its putrid quality. Any focus containing the gangrenous elements may become the source of the gangrenous pleurisy. Such a focus may exist in the gastro-intestinal tract anywhere from the pharynx to the anus, as in a carcinoma of the œsophagus, stomach, or intestine, or suppurating processes about the intestines.

In the lungs, bronchiectatic and phthisical cavities which have become gangrenous are within easy reach of the pleural lymphatics.

Breaking-down hydatid cysts may also furnish the gangrenous element.

Treatment of Empyema.—The diagnosis having been established by an exploratory puncture, the pleural cavity must be opened and drained as soon as possible. Aspiration is useless. The use of the trocar and canula is not advisable. Continuous siphon-drainage such as Bulau's is inconvenient and inefficient in the majority of cases. The case must be treated as one of ordinary abscess and the pleural cavity must be freely opened.

When prepared to operate, the rule should always be observed to make an exploratory puncture with an aspirating needle at the point where the incision is to be made, and not to begin the operation until pus has been found.

As a rule the patients will need an anæsthetic. Occasionally, if no excision of rib is required, the operation can be performed under cocaine. Anæsthetization should never be profound.

Opinions differ as to the best spot at which to make the opening. It is not essential that the pleural cavity should be opened at its lowest part, though it is of advantage to do so. The seventh interspace at the mid-axillary line or the eighth interspace at the angle of the scapula is generally chosen.

When the patient is anæsthetized care should be exercised not to roll him too far over on the sound side, as there is danger of compressing the uncrippled lung. A slight tilting by sand-bags under the back will suffice.

Shall a simple incision be made, or shall a portion of a rib be excised? On this point opinions differ. In children it does not seem, as a rule, necessary to remove any part of a rib. A simple incision and drainage for a week or so will generally be sufficient to effect a cure. It may be stated, therefore, that in ordinary cases of empyema in children a simple incision is all that is necessary. If a cure does not result from this a portion of rib can be removed at a later date. In adults, however, the best practice seems to be to remove an inch or more of the seventh or eighth rib. The opening thus obtained will secure better drainage, will probably shorten the course of the disease, and will also permit of a digital inspection of the lung and pleural cavity. Many cases, however, will recover promptly without the removal of the rib, and it cannot be laid down as an absolute rule that a portion of the rib must be excised.

The fluid should be allowed to escape slowly.

In chronic cases, however, of long standing a portion of one or more ribs should always be removed.

Irrigation, as a rule, should not be employed at the time of operation. It is a good rule never to employ irrigation when the patient is fully under the influence of an anæsthetic. More than one death has been caused by neglect of this rule. In cases, however,

where the pus is foul, or where there are present large masses of fibrin, or where the costal pleura is coated with tough and thick layers of lymph, irrigation is indicated. The fluid employed must be hot and should be normal sterile salt solution. There is no advantage in the use of antiseptic solutions, and the pleura absorbs so rapidly that there is some danger of systemic poisoning. While the irrigation is being employed the patient should be allowed to partially recover from the influence of the anæsthetic.

The elaborate plans of drainage are useless. A simple rubber drainage-tube with a calibre of half an inch inserted just within the pleural cavity is all that is needed. Care should be used to fasten it externally by a large safety-pin or suture so that it may not be sucked into the chest and cause a permanent fistula, and perhaps a suit for malpractice. The sterile dressing of gauze and cotton should be abundant so that it may absorb the discharge, act as a valve in preventing the entrance of air into the pleural cavity, and at the same time exclude infection from without.

The risk from the operation itself is trifling. The most dangerous part of it is the anæsthetic. It should be most carefully administered and but a small amount should be employed.

After-treatment.—For the first forty-eight hours after operation the patient should be allowed to remain quiet on his back. Systematic changes of position which will enable him to empty the pleural cavity must then be begun. He must be raised up and turned over on the diseased side several times daily and later may be encouraged to hang over the side of the bed with the hands resting on the floor. Efforts should be made to cause the lung to expand. Deep inspirations should be taken. If this fails a series of gallon bottles filled with water should be used (Woulff's bottles), the patient transferring by air-pressure the water from one bottle to another.

As a rule, no irrigation is needed. In favorable cases the tube can generally be removed at the end of ten days or a fortnight and the wound will be closed in from three to five weeks. When the case has been of long standing or when the pus is foul, daily irrigation with salt solution may be necessary. In these cases the duration of the opening may be months instead of weeks. In 46 cases collected by Runeberg the average time of healing was forty-eight days. In the 61 cases of Borivert it was forty-nine days (in 21 of these cases it was less than four weeks). In cases of long standing, especially in elderly patients where the ribs are very rigid and the cavity of large size, the chances of cure without further operation are not very favorable. In recent cases, however, especially in the young where the ribs are elastic and the cavity not too large, the chances of rapid cure are excellent provided the tubercular element be absent.

Should a profuse discharge continue for longer than seven or eight weeks without sign of decrease it is generally an indication that more radical measures may be needed. One of the simplest of these is the insertion of strips of gauze into the pleural cavity, which is thus packed as would be any other granulating cavity. A mild iodoform gauze may be used, but a careful watch must be kept for iodoform-poisoning. The gauze should be removed and the cavity irrigated and re-packed every third or fourth day. If a successful issue is to be expected, the external opening must be large. Benefit will occasionally be derived from this plan of treatment, but too much must not be expected from it.

Complications.—If the operation has been properly performed, the dangers of sepsis should be almost *nil*. If, however, it should develop, a freer opening must be made and frequent irrigations should be employed.

Another possible complication is abscess of the lung or brain.

Excoriation of the skin about the opening will sometimes be produced by the irritation of the discharge. A frequent change of dressing and the application of a bland ointment, as vaseline with 10 per cent. boric acid or the ointment of zinc oxide, will produce relief.

Suppuration of the chest-wall around the opening may occur. This may need free incisions. Caries of the ends of the rib may also result. Removal of the diseased bone will then be necessary.

In a considerable proportion of cases a permanent fistula will result leading into a large cavity which the lung cannot obliterate by its expansion. If at the end of several months there is no sign of its obliteration, one of the thoraco-plastic operations should be performed. Schede's operation, while more severe, seems more effectual than Estlander's. Its advantages consist not so much in the larger amount of chest-wall removed as in the removal of a large area of diseased pleura. The incision is begun at the outer edge of the pectoral muscle about the fourth rib and carried downward in a curved direction to the lower part of the pleural cavity, extending backward as far as the tenth rib in the post-axillary line. It is then carried upward along the vertebral border of the scapula (which is drawn forward by placing the arm across the chest). The large skin-flap, attached above, is then raised and a subperiosteal resection made of all the ribs between the second and ninth, from the junction of the rib with its cartilage in front to the tubercle behind. The rib is best divided by bone-forceps near the middle, the ends drawn outward and broken off at the points above mentioned. The thickened pleura and the intercostal muscles are then cut away. The skin-flap is let fall into place and sutured. Many months must elapse before a cure can be expected from this severe operation.

ABSCESS OF THE LUNG.

Etiology.—The exciting cause of a pulmonary abscess is the same as that of a suppurating process in any other part of the body, *i. e.* the presence of the pyogenic bacteria, generally the streptococcus or staphylococcus. These germs either gain access to the lungs through septic emboli from a more or less remote focus of suppuration, being conveyed by the blood or lymphatic current or by means of the inspired air. If the infection has been carried by the latter channel, the vitality of the affected portion of the lung must have been lowered by previous disease or by injury. When the infection is conveyed in the blood or lymph-channels a portion of a perfectly healthy lung may break down into an abscess.

If the infection be brought to the lungs by an embolus, this embolus is usually arrested in one of the pulmonary arterioles, and consequently is apt to lodge near the surface and shut off the blood-supply from a wedge-shaped portion of lung. There results a hæmorrhagic infarct which, becoming infected by the germs in the embolus, softens and is converted into an abscess. If in addition the germs of putrefaction gain access to this broken-down area, there results a spot of gangrene. A septic process anywhere in the body may be the starting-point of such an embolus; for example, a septic uterus following childbirth; sloughing bed-sores; suppurating joints; broken-down mediastinal glands; malignant pustule; glanders; carbuncles and boils; otitis media; a suppurating cancerous mass; an ulcerating appendix; an osteo-myelitis, caries or necrosis of any of the bones especially about the thorax; abscess of the liver.

Any infected wound of the skin, which may have healed superficially, can also furnish the septic element necessary.

Before the introduction of the aseptic methods in modern surgery the wounds made by the surgeon were not infrequently the starting-points of septic processes in various parts of the body. The lungs, being naturally the first organs to arrest the septic emboli, were not infrequently the seat of abscesses thus formed. These cases are but very rarely seen at present. Operations upon some diseased portions of the genito-urinary tract are, however, followed even now at times by the production of an abscess of the lung.

The heart itself may be the source of infected emboli; the pyogenic germs which have attached themselves to the damaged valves or to the vegetations upon these valves, or to the walls of the ventricle in their neighborhood, may be swept away by the blood-stream, to be subsequently lodged in the terminal arterioles. This occurs in cases of malignant endocarditis.

In punctured and bullet-wounds of the lung the pyogenic germs

may have been carried in by the weapon or the bullet, and then find an excellent soil in the lacerated lung-tissue, which subsequently becomes converted into an abscess.

In cases of empyema also, especially if the inflammation be of a severe grade, the lymphatics of the pleura and lung may become so choked with the pus as to undermine the lung-tissue itself, which becomes soft and finally breaks down into an abscess.

In some cases of pneumonia spots may remain from which the exudation has not been absorbed. Pyogenic germs are conveyed to these areas either through the inspired air or through the blood or lymphatics, and an abscess is the result.

As an etiological factor traumatism of the chest must be mentioned, with a resulting contusion of the underlying lung-tissue or even a rupture of a portion of it. This may well be followed by infection of the damaged area and the formation of an abscess.

Small areas of pneumonia from the inhalation of fluids or of solid matter—the so-called inhalation or inspiration pneumonia—may likewise become infected by these micro-organisms and break down.

Abscesses, however, most frequently follow some inflammatory condition of the lung in patients who have been debilitated by long-continued illness or alcoholic excesses. As a rule they do not form in the lungs of the young and healthy unless as the result of traumatism or septic emboli. It is true, however, that occasionally as the result of a pneumonia, grippe, or pleurisy a pulmonary abscess will result even in the young and vigorous. The vital forces of such patients must have been much depreciated by the original disease. The source of infection can often not be determined, but by exclusion the conclusion is reached that it is carried to the damaged area by the inspired air.

The diagnosis is often difficult. It is of importance, however, that an abscess should be differentiated from bronchiectasis, encysted empyema, and tubercular cavities. Apart from the physical signs the presence of elastic fibres or of the tubercle bacillus in the sputum ought to lead to a correct diagnosis as far as bronchiectasis or tuberculosis is concerned. Differentiation from an encapsulated empyema is not of so much importance, as the treatment for both conditions is very similar.

Treatment of Abscess of the Lung.—When the diagnosis of abscess has been made, what shall be the treatment of the case? In an abscess in any other part of the body there can be but one answer to this question, and that answer is free incision, evacuation of the pus, and thorough drainage. A categorical answer cannot be given, however, when the abscess is located in the parenchyma of the lung. It must be qualified, for the successful treatment of such cavities

depends much on the special conditions, both local and general, of each individual case. In certain cases the old rule, *Ubi pus ibi incisio*, must be strictly followed. In others it is of equal importance to ignore this rule. In still others, and this forms the largest class, it is difficult to decide whether or not operation is advisable. It is exactly in cases of abscess that lung-surgery has been most successful. Many satisfactory results have followed operative interference. We know how little can be expected from medical treatment; sufficient surgical experience has accumulated to enable us to intelligently contrast the surgical with the medical treatment of this class of cases.

Medical Treatment.—This will in a measure depend on the general condition of the patient, on the cause of the suppuration, and on the situation and extent of the abscess. In all cases, whatever the cause and whatever the local conditions may be, the indication is for stimulating and supporting treatment. Judicious stimulation and attention to nutrition are of more importance than are drugs or inhalations given for the purpose of exerting an antiseptic action on the abscess-cavity itself. It cannot be denied that benefit may be derived from the use of this class of remedies, as also from drugs which promote free expectoration. The position of the patient is also of importance. The indications will be discussed in the order of their importance.

Stimulation and Nutrition.—The greatest care must be taken to maintain in proper condition the functions of digestion and assimilation. Every effort should be used to prevent any disturbance of the alimentary canal. The expectoration of fœtid sputum is apt to cause gastric disturbances and disinclination to take nourishment. Local measures to be considered in a later section are sometimes beneficial in removing the nauseating odor and taste. It is largely on account of the importance of maintaining the digestive functions in proper condition that care must be exercised in the use of drugs. No general rules can be laid down in regard to the character or amount of either food or stimulants. A moderate use of alcohol in one form or another is generally indicated. As a rule whiskey is best, but brandy or some form of wine may be most suitable in certain patients. Even should the pulse be fairly good a moderate amount of alcohol is indicated. Alcoholic stimulation in any form of sepsis is always of great value. If, for example, the pulse is under 100 and of fair quality, 3 or 4 ounces of whiskey in the twenty-four hours will suffice; but if the pulse-rate is 120 or higher and the heart's action feeble, double or treble that amount may be indicated. Of course the manner of its administration, whether in milk or otherwise, must be regulated by the peculiarities of the case.

In addition to the alcohol it is generally well to give strychnine

either by mouth or by hypodermic syringe, preferably by the latter. The dose should be gr. $\frac{1}{30}$ every three or four hours, or, if the heart's action is very weak, as often as every hour. It is not uncommon for patients to complain bitterly of the frequent hypodermic injections, and in such cases it may be necessary to administer this drug by the mouth, provided that it is well borne by the stomach. Should the arterial tension be high nitro-glycerin may occasionally be indicated, in doses of gr. $\frac{1}{100}$ every three or four hours. Of course other heart-stimulants, as digitalis, strophanthus, etc., may be needed. The bowels should be kept open by gentle laxatives and the action of the kidneys maintained.

ANTISEPTIC AGENTS.—These are general and local.

General.—Drugs are employed whose elimination is partially accomplished through the bronchial tubes. The balsamic drugs, as turpentine, creasote, and tar, are chiefly employed for this purpose. If they could be used freely considerable benefit might be expected, but the stomach generally cries *halt!* The most easily borne is terpene hydrate or terebene in doses of 10 drops four times daily.

Local.—Antiseptics can be administered in the form of sprays, inhalations, and gargles. Of the sprays a 1 per cent. solution of carbolic acid or a solution of thymol 1 : 1000, or a 3 per cent. solution of peroxide of hydrogen, are the most efficient and agreeable. Of the inhalations a combination of creasote (wood), alcohol, and chloroform in equal parts is one of the best, or the formula given on page 658 of Vol. II. may be used. Eucalyptus, either alone or combined with other antiseptics, is one of the most popular local remedies, either in spray or gargle. Any of the antiseptics in weak solution may also be employed as gargles—carbolic acid, boric acid, or peroxide of hydrogen. Some of the semi-proprietary combinations are useful.

It must be acknowledged that medical treatment can be of but little avail. The *vis medicatrix naturæ*, when encouraged by proper food and stimulation of the heart, will accomplish more than drugs.

The most important point in the treatment of pulmonary abscess is the question of surgical interference. Is operation indicated, and if so, when? The decision of this question will depend on three conditions: first, the general state of the patient; secondly, the efficiency of the drainage through the bronchi; thirdly, the absence of general sepsis. Should the patient's general condition remain good, and should there be no marked loss of strength, the operation may be delayed. If on the other hand the strength of the patient should gradually fail, if the pulse should become rapid and feeble, then delay is unjustifiable. Also if signs of sepsis should develop, indicated by an increase in the temperature, a dry tongue, or delirium, immediate operation is demanded.

Proper drainage is essential to recovery. If there is evidence of the ability of the patient to empty the abscess-cavity by the efforts of coughing and maintain it in this state, then operation may be delayed. If, however, the cavity cannot be evacuated and in consequence remains partly filled with the purulent material, there is great danger of general sepsis, and the sooner an external opening is made the better will be the prognosis. The amount of sputum will generally give a fair idea as to the ability of the patient to empty the cavity, but occasionally the patient will swallow the greater part of his expectoration and so mislead the physician. The physical signs ought, however, to indicate the condition of the abscess-cavity.

It seems inexcusable to allow a patient to die from abscess of the lung without an effort being made to save his life by means of a surgical operation. As soon as signs of constitutional sepsis manifest themselves, or if there is evidence that the abscess is spreading, immediate operation is demanded. In cases of doubt it seems safer to operate than to trust to spontaneous recovery. Even cases that seem desperate may be rescued by a rapidly completed operation. A number of successful cases have been reported where it seemed questionable at the moment of operation whether or not the patient was in condition to bear the anæsthetic. The location, nature, and size of the abscess will have some influence in deciding whether or not an operation shall be done. An abscess near the apex is much more likely to drain into the bronchi and heal without operation than one situated near the base of the lung. This must have an important bearing on the decision. When near the base it is well to operate at an early stage of the disease. The chances are that sepsis or pyæmia will result if no external opening be made. It is otherwise with one near the apex. In such cases a certain amount of delay may be safe, but a most careful watch must be kept for constitutional symptoms or extension of the suppurative process.

It is often difficult to differentiate between a pulmonary abscess and an encapsulated empyema which has opened into a bronchus. If in doubt operation is indicated, as, should it be the latter, an external opening is urgently demanded.

The mortality of operations for pulmonary abscesses has been considerable, but in the last few years it has been steadily decreasing, and it will doubtless be still farther reduced now that physicians feel assured that there is a reasonable hope for recovery in any case of pulmonary abscess and an excellent chance for a successful issue provided that the operation can be done before the patient is saturated with sepsis or exhausted by fever. Statistics show that the mortality of operations done within the past three years has been not greater than 20 per cent. In former years it reached as high as 50 or 60

per cent. Trzebicki collected 42 cases which had been subjected to operation prior to 1892. Of these 14 recovered and 24 died, 3 being improved. Reports of more recent operations are, however, much more favorable, as in the 38 cases collected by Fabricant 29 recovered and 9 died, and in the 23 cases collected by Reclus (1885–1895) there were 20 cures and only 3 deaths.

"The nature of the primary disease plays a great part in determining the course of events: 17 cases of abscess after fibrinous pneumonia gave 14 cures and 3 deaths; 7 after specific fevers gave the following results: typhoid, 2 cases, both cured; scarlet fever, 1 case, which died; pyæmia, 4 cases, 3 cures, 1 death; suppurating hydatid cyst, 3 cases, all cured; bullet-wound, 2 cases, both cured. Pneumonia is therefore the commonest cause of abscess of the lung, and operation on abscesses of this character is in the great majority of instances crowned with success" (Reclus). Another quotation from the same author well expresses the views of many surgeons and physicians: ". . . . and may now assert that whenever there is an abscess there ought to be an operation. No need to wait till fever blazes up, till the patient is threatened with septic absorption and his general condition is alarming; one has no right to delay, save perhaps in a case where the abscess is very small, draining easily and readily into the air-passages, or where there are multiple abscesses requiring for their evacuation such mangling of the chest as would not be justified. Happily these latter cases are rare."

Operation.—Incision into pulmonary cavities was advised as long ago as 1710 by Baglivus and others. In 1850 Graux reported 13 unsuccessful cases of operation, and this with other unfavorable reports retarded the progress of thoracic surgery until fifteen or twenty years ago when numerous successful operations on animals raised the hope that similar results might be obtained as the result of intra-thoracic surgery on the human race. Except in cases of abscess, hydatid cysts, and gangrene this expectation has not been realized. In these three conditions, however, the results of operation are very promising.

The existence of adhesions between the lung and chest-wall has been hitherto and unfortunately still is by some surgeons considered a requisite for successful operation. More than one patient's life has been sacrificed on this account. In latter years many successful operations have been performed where there have been no adhesions between lung and chest-wall. While it is not denied that adhesions are of great value, yet they are not essential, and if operation is indicated by the symptoms it should be performed, adhesions or no adhesions.

Before operation it is often difficult to determine whether or not

the lung is adherent. The history of previous pain and the existence of friction-sounds in a case where the abscess is not of recent origin is generally an indication that adhesions have already formed.

Details of Operation.—The first step is to determine the existence of an abscess and its location. This is best accomplished by means of an exploratory puncture with an aspirating needle. Very possibly, however, this may fail to detect the abscess, as the pus may be too thick to pass through the needle or the cavity may be nearly collapsed. The needle used for this purpose must be a large one, at least four inches long and with a calibre of one to two millimetres. An ordinary hypodermic needle is almost valueless. The syringe must be in good order and possess a powerful suction-force. The small aspirating syringe or the large hypodermic syringe which is used for whiskey may be employed. The needle and syringe must be carefully disinfected according to the rules which will be found in the section on aspiration in pleurisy.

The skin of the patient is thoroughly cleansed by means of scrubbing with soap and water, followed by alcohol or ether and a solution of bichloride of mercury 1 : 1000. The probable site of the abscess has been already determined by the physical signs, and the needle is plunged in between the ribs in the direction of the supposed cavity. The abscess, of course, may be adherent and superficial, but generally it is necessary to thrust in the needle for a distance of three and a half to four inches before the cavity is reached.

As soon as the syringe has been introduced it may be determined by the oscillation of the needle that a cavity has been entered. On the other hand, no such sensation may be imparted to the fingers, and on withdrawing the piston no pus may appear in the syringe. The needle should then be removed and inserted at another spot, and so on for three or four punctures until the abscess is found. Even should all the punctures fail to find pus an attempt should still be made to open the abscess by an operation, provided that the symptoms and physical signs point decidedly to its existence. Even should then the cavity not be discovered the abscess may at a later date open into the incision which has been made in its neighborhood.

Considerable information as to the presence or absence of adhesions may be derived from the needle. If a sensation of its passage through thick, tough tissue is felt before it enters a cavity, this probably means the agglutination of the lung to the costal pleura. If, after the needle has entered the cavity, the syringe moves up and down with the respiratory movements, it tends to show that the lung is still unattached. If no such motion occurs it is probable that adhesions exist.

The presence and situation of the abscess having been determined,

the next step is its evacuation. For this purpose an ample opening should be made in the chest-wall at a point which will afford comfortable access to and free drainage for the cavity. As a rule, some point in the mid-axillary region will be found the most convenient; it may be between the posterior axillary line and the outer edge of the scapula, or between the anterior axillary line and the nipple line, but usually the spot selected will be in the mid-axillary line and between the fourth and eighth ribs. A free incision along the rib should be made at least three and often six inches long. The periosteum of the rib is divided, pushed aside with a periosteotome for a space of three to four inches, and that portion of the rib excised with a costotome (bone-forceps). This may give sufficient space, especially if the lung is adherent, but often it will be better to remove a corresponding portion of the rib above or below, and especially is this necessary where no adhesions exist and if an attempt is to be made to shut off the pleural cavity from contact with the contents of the abscess by either gauze-packing or suturing. It must be exceptional where an opening is needed larger than that afforded by the removal of portions of two ribs, each three or four inches long. It may be necessary, however, in cases where no adhesions exist and where the location of the abscess is uncertain, to remove portions of a third or even fourth rib. There is no disadvantage in a large opening, and it may be of distinct advantage if the lung at a later date refuses to expand sufficiently to fill the pleural cavity.

First will be described the method of procedure when the lung is adherent to the costal pleura. As a rule, in such cases the abscess is comparatively superficial and the danger of hæmorrhage is slight. The pleural layers are seen to be thickened, whitish in color, and generally firmly agglutinated. The incision into the abscess can be made without fear of infecting the pleural cavity. It may be opened by knife, scissors, trocar and canula, or cautery. The instrument employed will depend on the individual preference of the surgeon as well as on the location of the abscess. Prior to the incision, however, the operating needle should be again inserted, and, after pus has been found, should be left *in situ* in order to serve as a guide to the abscess-cavity. Indeed, in adherent cases the needle which found the pus before the chest-wall was opened can be left *in situ*, but in non-adherent cases this is inadvisable. With the needle as a guide the knife, scissors, or cautery slowly cuts or bores through both layers of pleura and through lung until the cavity is entered, when the pus runs out—it may be an ounce or so, it may be half a pint or even more. An opening large enough to permit of easy entrance of the finger should be made. As a rule the hæmorrhage is but slight, especially if the cautery has been used, but even after the knife or

scissors it is not alarming, at least so far as actual loss of blood is concerned. If the bleeding is free it may be wise to plug the opening at once with gauze to prevent the entrance of blood into the air-passages. On account of this danger the best instrument for making the incision into the lung is probably the Paquelin cautery, at least if the abscess is deeply situated. The finger is then passed into the cavity and gently swept around, breaking up the friable bands and removing sloughing tissue. Care must be taken not to tear apart bands of any considerable thickness, as in them may be blood-vessels of some size. Careful palpation with the finger in the interior of the cavity should then be made for the purpose of ascertaining if there be secondary abscess. Should soft spots be discovered these must be punctured by finger, scissors, or cautery, so that free drainage into the original cavity may be afforded.

The interior of the cavity should be gently swabbed with bits of sterile gauze on the end of long forceps. No irrigation should be employed. This, at least, is a good rule, as there is danger of drowning the patient with the irrigating fluid, and it certainly should never be employed as long as the patient is fully under the influence of an anæsthetic.

After cleansing the cavity it should be drained by a large soft-rubber tube and by strips of gauze (iodoform or sterile) passed into the cavity and brought out through the opening in the chest.

Second—when the lung is found not adherent to the costal pleura. If, after opening the chest-wall, the lung is seen to move upward and downward with inspiration and expiration, adhesions do not exist and the procedure just described must be modified. That plan is safest whereby the operation is completed in two stages. The older surgeons advised the employment of caustics which were placed in the pleural cavity and allowed to remain for a few days until sufficient inflammation had been excited to cause adhesions between the pleural layers. This, however, is an uncertain and clumsy method. A much safer plan is, after making a large opening by the excision of portions of two ribs, to strip the parietal pleura from off the chest-wall for a considerable distance around the opening so that there may be a considerable area of free parietal pleura which can be sutured to the visceral layer.

The pleural cavity is then cautiously opened and the lung quickly seized, before it has collapsed, with forceps, and while thus held the flap of the parietal pleura is sutured to the lung with catgut carried in a curved needle. If the incision into the abscess can be delayed for a few days, a few sutures will suffice, gauze being packed around the line of suture. If, however, it is necessary to open at once—and this is generally the case—the two layers of pleura should be accurately

approximated by a continuous suture running entirely around that portion of the lung into which the incision is to be made. In this manner the pleural cavity is completely shut off from danger of contact with the abscess-contents. Serous membranes unite quickly, and after a delay of even twenty-four hours sufficiently firm adhesions may have formed to allow of an incision into the cavity without danger of exciting a pyo-pneumothorax. Of course this means a second operation, but the incision into the abscess-cavity can often be made without an anæsthetic, or perhaps with the aid of a few whiffs of chloroform. It is rare that a longer delay than twenty-four hours is advisable, though if it be possible to wait three or four days the adhesions will be more secure. As stated, however, the abscess must generally be opened at once, and thus no opportunity be given for the formation of adhesions. In many cases it will be found exceedingly difficult to unite by suture the two layers of pleura, as the lung may be contracted and adherent to the internal wall of the pleural cavity. In many others the condition of the patient will demand a rapid completion of the operation and will not allow of the time needed for the application of the suture. Under these circumstances the pleural cavity must be protected by gauze compresses and sponges from contact with the pus.

If the pleural cavity should, during the operation, have become infected, it is perhaps wise to make a second opening near its base and insert a tube for drainage and irrigation.

The external dressing, which ought to be abundant, will probably be thoroughly saturated in twenty-four hours and should be changed. The gauze with which the abscess-cavity was packed should, as a rule, not be removed for at least forty-eight hours or longer. There will generally be considerable fœtor and it is wise in this case to gently irrigate the abscess-cavity with salt solution, and if necessary the pleural cavity as well. The dressing after this, for a time at least, should be removed every forty-eight hours. The cavity usually closes rapidly, and the packing and tubes can soon be dispensed with.

Hæmorrhage after operation, both from the wound and through the bronchi, is often a troublesome and sometimes a dangerous complication. The treatment should consist of absolute rest with perhaps inhalations of oxygen, and ice on the chest and by the mouth. These hæmorrhages, however, are apt to continue until the sloughs have been cast off.

If the shock of operation has not been too great the patient ought slowly to improve, though, as a rule, convalescence is tedious. Food and stimulants in abundance, and tonics, with perhaps oxygen, should be given. As soon as the strength will permit an out-door life in a balmy climate should be chosen.

GANGRENE OF THE LUNG.

Etiology.—In considering the etiology of gangrene of the lung it is convenient to recognize two varieties of the gangrenous process—one the so-called "embolic gangrene," where a putrid embolus is carried by the blood-current to the lung and there arrested in one of the terminal arterioles; the other where the gangrenous process is engrafted upon a previously existing lung-lesion.

The bacteria of putrefaction are in all cases the cause of the gangrene. No one specific bacterium has been found. They must have, however, a suitable soil for propagation. This is especially true as regards the gangrene which follows inflammatory conditions of the lung. The air-passages constantly contain these germs, and a suitable culture-bed seems only to be found in individuals whose health has been undermined by illness, alcoholic excesses, or bad hygienic surroundings. The white blood-cells of such patients seem to be lacking in phagocytic power.

The poisonous embolus may have its origin in a putrid process in any part of the body, a sloughing bed-sore, an osteomyelitis, a malignant endocarditis or a septic process in the female sexual organs. Necrotic areas of suppuration about the thorax, larynx, or œsophagus are a fruitful source of gangrenous emboli on account of the easy access from these parts to the lungs. Indeed, spots of broken-down tissue in any part of the body may be the source of these emboli. As a rule they lodge near the surface of the lung and the affected area is at first wedge-shaped.

Foreign bodies which, entering the larynx, lodge in a bronchus are a not infrequent cause of gangrene. Coins or particles of food which have "gone the wrong way," or have been regurgitated from the stomach, have been recorded as exciting causes. After an accident of this sort a zone of inflammation is gradually set up around the foreign body at the site of its arrest; the putrid bacteria gain access to this area and a certain amount of gangrene of lung-tissue is the result. The prognosis in such cases is not always unfavorable, because the foreign body, released from its position by the disintegration of the surrounding bronchial wall, may be coughed up together with the gangrenous lung-tissue.

Hæmorrhagic spots the result of contusions of the lung or the damaged areas around the track of a bullet or a sharp penetrating instrument may become infected by putrid germs conveyed in the inspired air. The areas of atelectasis in broncho-pneumonia may become similarily infected.

Diabetics seem especially prone to develop gangrene, due to the feeble resisting power of their tissues. In the insane the direct cause

of the inhalation pneumonia which results in gangrene may often be the paralysis of the muscles of deglutition. This is seen especially in cases of bulbar paralysis.

Fœtid bronchitis is perhaps the most common cause of gangrene. The process spreads from the bronchi to the alveoli, and small portions of the gangrenous lung may be expelled in the expectoration. The differential diagnosis between these two diseases is apt to be very difficult. The fœtid bronchitis is very often the forerunner of gangrene, and the transition from one to the other may be gradual and insidious. The diagnosis "fœtid bronchitis" has doomed more than one patient to death where a timely operation might have been followed by a different result. In fœtid bronchitis there is apt to be a larger amount of thin, watery secretion with a sweetish putrid odor perhaps lighter in color and less stinking than in gangrene, where the expectoration is inclined to be darker and resemble sloughing broken-down tissue. Too much reliance, however, should not be placed on such distinctions.

The differential diagnosis of gangrene from bronchiectasis or an empyema with a bronchial fistula is also often attended with difficulties.

A tubercular process which has become infected secondarily by the pyogenic bacilli must also be distinguished from gangrene.

In reaching a diagnosis the history of the patient is often of great value. This, with the physical signs and the character of the expectoration will generally lead to a correct diagnosis. The presence of elastic fibres in the sputum ought to exclude bronchiectasis, and when tubercle bacilli are found the diagnosis of pulmonary tuberculosis is reasonably certain. In gangrene there may be almost an entire absence of expectoration, and the stinking breath, with the physical signs, must in such cases suffice for a diagnosis.

The distinction between circumscribed and diffuse gangrene is of great importance both as regards prognosis and treatment. In the circumscribed there may be one or several foci. In diffuse a whole lobe or the whole lung may be affected. The process at first may be circumscribed and later become diffuse. Fortunately the circumscribed form is of more common occurrence than is the diffuse.

Prognosis.—A certain number of cases recover without operation. The mortality, however, is at least 75 per cent. The mortality of cases subjected to operation is considerably lower, and doubtless were the patients sent to the surgeon at an earlier date the prognosis would be still less unfavorable. Many patients have been kept under medical treatment until practically all chance for recovery is past, and as a last resort are handed over to the surgeon. What chance can there be for such patients from any method of treatment? In spite of this the operative mortality has been less than 40 per cent. Heyd-

weiller collected 40 cases operated on prior to 1892. Of these 22 recovered, 14 died, and 4 were improved. Reclus reports on 14 cases operated on within the past ten years with only 2 deaths, 11 having been cured and 2 improved.

As in pulmonary abscess the prognosis will vary considerably according to the cause of the gangrene. Take, for example, the statistics collected by Fabricant concerning 26 cases: 6 cases after acute fibrinous pneumonia, 4 cured; 4 after purulent bronchitis, 2 cured, 2 relieved; 1 after inflammation of the mastoid, cured; 2 after foreign body in the air-passages, both died; 2 after bronchiectasis, both died. The prognosis, however, must always be extremely grave. This is due as much to the wretched general condition of these patients as to the local lesion. While a few cases of undoubted gangrene have recovered without operation there is an element of doubt as to the correctness of the diagnosis in many of the cases reported as cured by medical treatment.

Treatment of Gangrene of the Lung.—Much that has been written in the previous section concerning the treatment of pulmonary abscess will apply to gangrene. Attention to the nutrition and proper stimulation of the patient is of prime importance. Balsamic drugs and antiseptic inhalations are also beneficial. When the diagnosis of gangrene has been certainly made, the important question of operative interference will at once arise. In many cases this is, of course, out of the question. When from the start the gangrene is diffuse, involving the greater part of one lung, operation cannot be recommended. In such a case the one indication is to keep the patient as comfortable as possible. In others the general condition or the complicating diseases contraindicate operation.

It is different, however, when the process is circumscribed and the patch is single and comparatively limited in extent. The patient, if young and in fairly good health, may recover without operation, and in such a case it may be advisable to wait, provided there are no signs of general sepsis or of spread of the process. Both these dangers, however, are very great, and it is a question whether or not even in this class of patients early operation would not be the safest plan of treatment. One can never tell when a general sepsis will start up or when a septic embolus may fly to some other vital organ. All may seem to be favorable, and yet in a few hours some irreparable injury has been done.

A number of arguments are advanced why operation should be delayed, the most important, of course, being that the patient may recover without surgical interference. Another is that operation should not be attempted until the stage of consolidation has passed and deliquescence has begun: the answer to this is that in all prob-

ability deliquescence has already begun if the diagnosis of gangrene has been made. Another is that one should wait until adhesions between the lung and pleura have formed. Doubtless these adhesions make the outlook much more favorable, but several successful operations have been performed in their absence, and while waiting for their formation the general sepsis may become so advanced as to exclude later operative procedures. Delay may be fatal.

It is a grave question whether or not it would not be wise to advise operation in every case of *circumscribed* gangrene, unless where from the first the general condition of the patient or intercurrent diseases indicate the hopelessness of any form of treatment. On this point medical men are wavering, and surgeons are inclined to advise more frequent and earlier resort to operative interference. It often, however, seems justifiable to delay operation if the gangrenous patch is small, if the general condition of the patient is good, and if there are no signs of constitutional infection. In patients over fifty such delay, however, seems unwarranted. In any case where operation is postponed a most careful watch for new symptoms or spread of the gangrene must be kept. The patient is on the edge of a precipice, and at any moment a complication may arise which will render the case hopeless.

The operative technique will differ but slightly from that recommended for abscess. The opening should be large, even larger than in cases of abscess. Adhesions are of great advantage, but if not found the pleural cavity must be protected as well as possible. The danger of hæmorrhage is comparatively slight. The incision into the lung is best made by the cautery. This should be used very freely and the sloughing portion perforated in many directions and as much of it destroyed by burning as seems safe. As much of the gangrenous lung-tissue should be removed as possible, provided the condition of the patient permits of a prolonged operation. Generally, however, one must be content with a free incision into the gangrenous patch. Thorough drainage and packing the cavity with strips of iodoform or sterile gauze is necessary.

The shock as a rule is not great, and often within forty-eight hours improvement will be noticeable. The packing should be removed at the end of forty-eight hours and the wound carefully cleansed, gentle irrigation with hot salt-solution being employed. A frequent change of dressing, at least once in forty-eight hours, will be necessary for some time. Convalescence is apt to be slow, and a chronic fistula may result which at a later period may necessitate one of the operations of thoracoplasty. All efforts should be directed toward supporting vitality.

An attempt should be made to disinfect the sputum and to keep the mouth as sweet as possible. As long, however, as sloughing tissue remains in the lung the fœtid expectoration will continue.

PNEUMONIA, CROUPOUS AND CATARRHAL, AND PLEURISY.

By JAMES B. HERRICK, A. B., M. D.

ACUTE CROUPOUS OR LOBAR PNEUMONIA.

There is a quite general belief that croupous pneumonia is an acute infectious disease produced, by local action on the lung, by the pneumococcus. From the primary pulmonary focus there originates a systemic toxæmia producing the constitutional symptoms. In not a few cases there is, in addition, an invasion of neighboring tissues by the pneumococcus, with resulting inflammation—direct infection by continuity—or an escape of the organism into the blood-current, with complicating pneumococcal inflammation in distant organs—metastatic infect. ... After a certain period, averaging about seven days, there is produced an antidotal toxin, the anti-pneumotoxin (Klemperer), which, overcoming the effect of the toxin, causes the well-known clinical crisis.

This organism, commonly called the *diplococcus pneumoniæ* of Fränkel or the *micrococcus lanceolatus pneumoniæ*, while not answering in every particular the requirements of Koch's laws, is regarded by most bacteriologists as the sole cause of true croupous pneumonia. It is commonly found in pairs, though single forms are also seen, or several cocci are united into a short chain. The coccus is, morphologically, a cross between a coccus and a bacillus. Commonly it is oval, with one end tapering, the blunt end being in apposition with the corresponding blunt end of its fellow. It is not motile and does not form spores. In the tissues and fluids of the animal body and in some cultures the coccus is found surrounded by a capsule. Ordinary aniline dyes stain the diplococcus in cover-slip preparations, and commonly the capsule as well. Welch[1] recommends the following method as a useful one in difficult cases: The specimens, prepared without water, are treated first with glacial acetic acid, which is at once allowed to drain off, and is replaced (without washing in water) with aniline-oil gentian-violet solution. The staining solution is repeatedly added to the surface of the cover-glass until all of the acid is displaced.

[1] *Johns Hopkins Hospital Bulletin*, vol. iii. No. 27, p. 128.

Wash with a 2 per cent. solution of common salt and examine in the same solution.

Particulars as to cultures must be sought in special works on bacteriology. Only certain facts of general interest will be here referred to. The pneumococcus grows with or without the presence of free oxygen—*i. e.* it is a facultative anaërobe. It is very sensitive as regards the reaction of the medium upon which it grows, requiring one that is slightly alkaline. It varies extremely in its cultural behavior, so much so as to suggest the division into different varieties. In cultures it is short-lived. Growing rapidly, it is commonly inert at the end of a week. This fact is suggestive of a partial explanation of the clinical phenomenon of crisis. And it may explain also the comparatively benign course of pneumococcic inflammation in other tissues, as, for instance, in the pleura. An empyema due to the diplococcus is usually relatively mild and amenable to relatively mild treatment. Great variations in the virulence of this organism are found. The cocci, especially in sputum, resist desiccation and retain their virulence for long periods of time. Cases are recorded where after many months the disease has been communicated to the newcomer into the house where the disease had previously prevailed. Thus Schröder[1] reports that from one house there came to the polyclinic at Kiel 32 cases in the fifteen years 1868 to 1892—never less than 1 case, once as high as 6 cases, in one year.

Inoculation experiments show not only great variations in the degree of virulence, but seem to prove the existence of varieties of the pneumococcus. One variety, the fibrinogenic (Foà), produces a true septicæmia, the cocci multiplying rapidly in the blood. It is this variety that was believed to be the cause of epidemic cerebro-spinal meningitis, though recent investigation (Jaeger, Heubner, Fürbringer, Kiefer) seems to prove that a coccus (meningococcus) described several years ago by Weichselbaum, and morphologically not unlike the gonococcus, is the prime cause of this affection. A second variety, the œdematogenic, produces local œdema with toxæmia. It is the variety commonly found in pneumonia. A third variety produces abscess, and is an "exquisitely pyogenic micro-organism."[2] Inhalations of air containing pneumococci, or the injection of cultures into the trachea or lung, have resulted in croupous pneumonia in the lower animals.

These facts concerning the diplococcus may help to explain some of the clinical peculiarities of the disease and to account for the vary-

[1] "Zur Statistik der croupösen Pneumonie," *Thèse*, Kiel, 1882.

[2] Welch, *loc. cit.* This article, though not yet completed, we believe, contains a most thorough review of the knowledge concerning the diplococcus, its history, morphology, cultures, inoculations.

ing results of pneumococcic inflammation. These facts, also, have led some to regard as still open the question as to whether the diplococcus of Fränkel is the sole cause of croupous pneumonia. It is claimed by these that in some cases of croupous pneumonia Fränkel's diplococcus is not found. Claiming that other organisms (Friedländer's bacillus, the streptococcus, and staphylococcus pyogenes) than the pneumococcus may produce lobar pneumonia, they contend for the plurality of the cause against its unity. (Weichselbaum, Jürgensen, Finkler.) Again, there is not always a uniform result from inoculation experiments even when the lungs are directly attacked by the experimentally introduced micro-organism. And, finally, how can a disease of such classically typical course as pneumonia be due to an organism that is found in the mouths of healthy persons, and that produces diseases of such diverse character as meningitis, endocarditis, arthritis, peritonitis, otitis, pleuritis, salpingitis, etc.? The advocates of the pneumococcic origin of every croupous pneumonia contend that if carefully sought for it can be found in every case; that typical croupous pneumonia can be experimentally produced; that differences in virulence, in variety, in environment, explain differences in the results of pneumococcic infection. The position of these men is succinctly and clearly stated by Netter when he says: "The relation between lobar pneumonia and the pneumococcus is to-day no longer questionable."[1] And, again: "There is no pneumonia (lobar) without the pneumococcus."[2] Wherever other micro-organisms than the pneumococcus are present in lobar pneumonia, they are there because of a secondary or mixed infection.

One feels, after studying the bacteriology of pneumonia, that there is much that is not yet clearly understood. The varieties of the diplococcus, its varying degrees of virulence, its different effects in different localities, the pseudo-lobar pneumonias where the diplococcus is not found, offer a rich field for investigation. One is reminded of the analogy between diphtheria and pneumonia. Each is due to the local action of a specific germ, with secondary toxæmia. It is probable that in pneumonia there is a form due to the diplococcus of Fränkel, the true croupous pneumonia, just as there is a true diphtheria due to the Klebs-Löffler bacillus. But there are other forms of pneumonia resembling clinically and anatomically lobar pneumonia. These cases, pseudo-lobar in character, are comparable to the pseudo-diphtheritic anginas that clinically are, at times, indistinguishable from the Klebs–Löffler anginas. Should the use of serum in the treatment of pneumonia prove a success, the question to be decided in an individual case will be, not so much whether the pneumonia is a croupous or broncho-pneumonia, but whether it is due to a diplococcus, strep-

[1] Charcot's *Traité de Médecine*, tome iv. p. 852. [2] *Ibid.*, p. 861.

tococcus, staphylococcus, bacillus diphtheriæ, etc., or to combinations of these organisms. A classification and differentiation based on bacterial causes will be of more value than the anatomical differentiation now in vogue. The last word concerning the etiology of pneumonia has not yet been written.

The existence of the diplococcus in the buccal cavity was known before the relation of the germ to pneumonia was recognized (Sternberg, Pasteur). The frequent occurrence of the coccus in the mouth and pharynx offers a ready explanation, through auto-infection, for the development of pneumonia when the organisms are in sufficient numbers, of the requisite virulence, the lungs unusually vulnerable, or the environment favorable for the growth of the germ. The frequent relapses so common in this affection are more clearly understood when we call to mind the almost uniform presence, for months and years, of the pneumococcus in the bucco-pharyngeal cavity of patients who have had pneumonia.

The resistance of the pneumococcus to desiccation, particularly when in sputum, enables one more clearly to understand the apparent contagiousness of the disease and its repeated appearance in the same house, to which fact reference has already been made. Pneumonia may be regarded as contagious in the same sense in which typhoid fever and pulmonary tuberculosis are contagious—*i. e.* in order that the disease may be communicated from the patient to the well person the germ must be communicated, and this germ, so far as danger of communication goes, resides solely in the sputum of pneumonia and pulmonary tuberculosis and in the stools of typhoid-fever patients. The necessity for proper disposal of the sputa of pneumonics is thus early seen.

The fact that pneumonia is more common in the winter and spring is well known. Why this is so is still unsettled. No age and no sex is spared.

Debilitating or depressing diseases offer favorable conditions for pneumococcic invasion. It is the terminal affection, therefore, in many cases of Bright's disease, alcoholism, malignant growth, typhoid fever, diabetes, etc. Contusion of the chest may be followed by lobar pneumonia. Exposure to cold is the history in many cases, and probably favors the development of pneumonia by producing a *locus minoris resistentiæ* in the lung. The inhalation of gases or of mineral dust may be an exciting cause for the localization of the coccus. Previous attacks, as has been said, confer but a brief immunity and predispose to second attacks.

Treatment.

The treatment of lobar pneumonia may be discussed under the heads of prophylactic and active treatment.

Prophylactic Treatment.—Recognizing that pneumonia is especially prone to attack the weak and debilitated, especial care should be exercised by such people to avoid exposure to cold. There seems to be no question that in a certain proportion of cases, by no means insignificant, exposure to cold is the determining cause of a localization of the pneumonic process in the lung. Patients with Bright's disease, diabetes, malignant growth, primary or secondary anæmia, and, above all, those who have previously had pneumonia, should be extremely cautious as to exposure to cold, and should avoid unnecessary contact with patients ill with pneumonia. The writer has known of more than one instance where a patient in a room with a pneumonic has contracted the disease. It is wrong to bring cases of typhoid, malaria, bronchitis, measles, pertussis, etc. into too close relation with pneumonia. Without doubt, in not a few hospital cases where typhoid has been complicated by pneumonia the secondary infection could be traced to a case of pneumonia in a neighboring bed, cared for, perhaps, by the same nurse.

The danger of communication of the disease from one patient to another can be reduced to a minimum by the proper disposal of the sputa. The pneumococcus in the sputum resists light and drying much longer than in pure cultures. It has been found actively virulent in dried sputum after the lapse of several months.[1] Netter is emphatic in his declaration that the contagiousness of pneumonia resides solely in the sputum containing the coccus. This being the case, the necessity for proper disposal of sputa is clear. As much care should be exercised as in a case of pulmonary tuberculosis. Proper cups should be provided, either of paper, so as to permit of burning, or of metal so that they may contain some germicidal solution and may be cleansed by boiling. Handkerchiefs should preferably be of cheese-cloth, frequently changed and burned. It would be well to have a towel or large napkin tied about the neck of the patient to catch any stray sputum and thus to save the bedding and garments of the patient. This napkin could be frequently changed and boiled. The utensils employed about the patient, as well as the clothing, should be sterilized before being again put to general use. The nurse should exercise unusual care in seeing that the face and hands of the patient, as well as her own hands, are often cleansed. Such directions may seem pedantic. It is probably only man's relative insusceptibility to the pneumococcus that prevents the more frequent endemic outbreak of pneumonia in families and in hospitals where cases of this disease are taken care of in the too often negligent manner as regards sputum-disposal. But we must remember that this extreme care may prevent a nurse, a patient sick of some other disease

[1] Bordoni-Uffreduzzi, *Arch. per le Science med.*, 1891, vol. xv. fasc. 3, p. 341.

in a neighboring bed, or an occupant of the same room or house from contracting, not alone pneumonia, but some other pneumococcal affection. From a carelessly handled case of pneumonia (compare a carelessly handled case of pulmonary tuberculosis) cocci may lodge in the nose or pharynx of some innocent person, to work harm at some later time, perhaps, in the shape of pneumonia, meningitis, arthritis, pleuritis, or any of the varied manifestations of this protean microbe. With proper care a case of pneumonia need be no more a source of danger than a case of pulmonary tuberculosis, typhoid fever, or cholera.

Active Treatment.—The active treatment may be specific, expectant, or symptomatic.

Specific Treatment.—A glance at the mortality statistics of pneumonia, where the death-rate is anywhere from 1 or 2 per cent. to 50 per cent., will convince one that there is no specific treatment that is uniformly successful.[1] A study of the literature on the therapeutics of pneumonia, a perusal of the discussion on the treatment of this disease in the British Medical Association,[2] or of the symposium by American pædiatrists,[3] or by Paris physicians,[4] shows such a lack of uniformity in treatment as to convince one that there is no drug or remedial agent universally employed in pneumonia and accomplishing such definite results as to be called a specific. There is no drug for pneumonia comparable to quinine for malaria, potassium iodide for syphilis, iron for chlorosis, thyroid extract for myxœdema, diphtheria antitoxin for diphtheria. One may, in one's own limited experience, become convinced that the excellent showing made in the series of 20 or 50 or 100 cases is due to the remedial agent employed—that this agent is a specific; but the next few cases or the next epidemic may show one that, after all, it was but the *vis medicatrix naturæ*, favorable environment, etc., and not one's remedy that wrought the cure.

Serum-therapy.—The hope for a specific lies in the direction of serum-therapy. Promise of much has been given, and we are justified, from what has already been accomplished, in looking for an antitoxic serum or antidotal chemical that shall do as much for croupous pneumonia as the Behring antitoxin has done for diphtheria.

No anti-pneumotoxin or healing serum is yet on the market. Nor have results thus far, particularly in the treatment of pneumonia in man, been uniform enough or in large enough numbers to warrant definite statements concerning the serum treatment of pneumonia.

Immunity can be conferred upon animals (rabbits, mice, guinea-pigs) by the injection of filtered cultures, cultures heated for an hour

[1] Wells (*Journal of the American Medical Association*, 1892) in 233,730 cases found a mortality of 18.1 per cent.

[2] *British Medical Journal*, Nov. 9, 1895.

[3] *Archives of Pædiatrics*, April, 1896.

[4] *La Semaine médicale*, 1891, No. 55.

or two to 60° C. (G. and F. Klemperer, 1891), or by the use of the juices from animals dead of pneumococcal septicæmia (Emmerich and Fowitzky, 1891). Various other methods of producing immunity have been successfully tried. Diluted but virulent cultures have been employed (Emmerich). Belfanti (1892) succeeded with a filtrate obtained from pneumonic sputa; Foà and Scabia (1892) used a glycerin extract from the blood of an infected rabbit. Immunity conferred in any of these various ways appeared in from a few days to two weeks, and lasted varying lengths of time. The Klemperers called the substance that is injected in the cultures, the juices, or the extracts, the pneumotoxin. As a result of the protective inoculation an antidotal substance is produced in the body of the animal rendered immune, to which substance they gave the name anti-pneumotoxin. This name and theory have been quite generally accepted since the Klemperers' communication in 1891. This important article, that is so often referred to in recent works on pneumonia, is in the *Berliner klinische Wochenschrift*, 1891, Nos. 34 and 35.

But another important fact announced by the Klemperer brothers and by Emmerich and Fowitzky[1] was that serum or expressed juices from an immune animal when injected into other animals rendered them immune. More than this, the serum from an immune animal had the power to check the progress of infection in an animal inoculated with the pneumococcus. The Klemperers found a prompt reduction of temperature followed the injection of blood-serum from an immune animal into the circulation of an infected animal. This was not a mere antipyretic effect, as a drop in temperature did not occur when similar amounts were injected into healthy animals or into animals infected with organisms other than the pneumococcus.

From experiments on animals they turned to pneumonia in man. Injections of serum from immunized rabbits produced fall of temperature. This was not always permanent, but was prompt and unmistakable. In diseases other than pneumonia, *e. g.* typhoid fever, no effect followed the injections of serum. Others have repeated their experiments with varying results. Mosney's[2] results in animals were less favorable. Foà and Scabia, while successful in the case of animals, were not so fortunate in the case of man. Emmerich criticizes their work because they did not use the serum of "highly immune" animals. Bonome,[3] repeating Klemperers' experiments, could readily induce immunity, but was not so successful in his therapeutic effects. C. Jannson[4] had favorable results in 10 cases, using serum

[1] *München. med. Wochenschrift*, 1891, No. 32.
[2] *Archiv. de Méd. experimentelle*, 1892, No. 2.
[3] *Fortschritte der Medicin*, 1891, No. 18.
[4] *Hygeia*, April, 1892, abstract in *Centralblatt für innere Medicin*, 1892, p. 847.

of immunized rabbits. In 1 case in particular the effect was "marvellous." Shattuck, in an address before the Massachusetts Medical Society in 1893, reported that in 39 cases of pneumonia in man treated by serum 38 had recovered. Hughes and Carter, using serum from convalescents, had rather negative or uncertain results. Lichtheimer[1] used blood-serum and pleural exudate from pneumonics with seeming good results. If the Klemperers' experiments, using cultures heated to 60° C., are found to be uniformly successful, the problem of serum-therapy is much simplified, as the immunizing material is thus quite readily obtained.

It seems that these investigators are on the right track, and that the future treatment of pneumonia is in serum-therapy. To quote Emmerich: "The active principle (healing substance, *Heilstoffe*) in the serum of immune animals will some day be found to have an ideal curative power for man; this is certain and only a question of time." The treatment may not, however, be so simple as at first sight it would seem to be, for in diplococcal pneumonia, as in diphtheria and pulmonary tuberculosis, secondary and mixed infections often play an important rôle, and pneumococcal serum-therapy may have to be combined with that of other organisms in some cases before success is met with.

Treatment by Cold to the Chest.—While it is not claimed by those who advocate the application of ice to the chest that this method is a specific in pneumonia, they do claim that it should be used in every case of the disease, that it reduces mortality to a lower point than does any other method of treatment, and that it is more than a symptomatic treatment. It may therefore be properly discussed under the head of specific therapy.

The application of cold was advocated as far back as Niemeyer's time. Lately there has been a revival of interest in this matter, and enthusiastic writers urge that it should be the treatment for all cases of pneumonia, comparing their results by this treatment with the results of the Brand treatment of typhoid. A reduction in temperature, a lessening of pain, a slowing of the pulse and of respiration, are observed soon after the ice is applied. But it is believed that there is more than this symptomatic improvement. The violence of the inflammatory process is mitigated by contraction of pulmonary capillaries and improvement of their tone, and resolution is favored. This is believed to be the case not alone from subjective symptoms and early crisis, but because physical examination reveals "a striking arrest in the development of the physical signs"[2]—a repression of the inflammatory process in the lung.

[1] *Deutsche med. Wochenschrift*, June 23, 1893. [2] Lees, *Lancet*, Nov. 9, 1889.

Dr. Thomas J. Mays of Philadelphia writes as follows:[1] "How it can dissolve an exudate or an infiltration is not so clear to me. That it accomplishes this I am firmly convinced. For example, there is a pneumonic area which is wholly devoid of vesicular sounds, and has a flat percussion note and bronchial breathing, indicating beyond doubt that the process has passed beyond the stage of engorgement and into that of exudation or of infiltration; yet the application of ice to this spot will in a remarkably short time develop a new group of physical signs, such as crepitation, reappearance of the vesicular murmur, diminution of flatness. This has been observed by myself over and over again."

In this method of treatment cold is applied by means of ice contained in bags which are wrapped in towels. The affected area is covered with these bags, even though two or more are required. If the inflammation extend to other portions of the lung, it is followed up with the ice-bag.

No bad results are reported from this method of treatment. The statistics of Mays[2]—195 cases—show 7 deaths, a mortality of 3.58 per cent. The number of cases is far too small to permit of generalization. Yet it is but fair to record that in the experience of Drs. Mays, Lees, and some others the ice-bag treatment of pneumonia is safe, lessens unpleasant symptoms, hastens resolution, and gives a low mortality rate.

Digitalis.—Petresco[3] (Bucharest) has repeatedly asserted that the most favorable results in pneumonia were obtained by the use of large doses of digitalis. When we remember the cautions ordinarily urged against the use of too much digitalis, we are astonished to read that Petresco claims that unless 75 to 150 grains of digitalis-leaves are used in twenty-four hours the beneficial effects will not be observed. He makes an infusion of 4 parts of digitalis leaves to 200 of water, and adds 40 parts of syrup of orange-peel. Of this infusion he gives a teaspoonful every half-hour. Petresco has seen no evil results from these enormous doses, even though they are continued for four days. To prove that the leaves he first employed were not inert, he has obtained and used samples from various pharmacists, and always with the same good results and with no toxic effects.

The benefit is seen in a lowering of the temperature, a slowing of the pulse even to thirty or forty, and in an early crisis. Petresco's explanation of the good results of the digitalis treatment is that it stimulates the vagus, improving cardiac, pulmonary, and bronchial

[1] *Medical News*, October 13, 1894.

[2] *Trans. Philadelphia County Medical Society*, 1895, xvi.

[3] Petresco has written many articles on this subject. As containing the substance of his writing may be consulted: *Therap. Monatshefte*, February, 1891; *Revue de Méd.*, 1894; and the *Proceedings of the XI. International Congress in Rome.*

activity, and seriously modifying the inflammatory process. Since 1883 he has treated 1192 cases, with a mortality of 1.2 to 2.6 per cent. The crisis commonly occurred on the third day, the temperature often falling considerably below normal, and the pulse frequently dropping to 36.

In this connection one fact must not be forgotten, that Petresco's cases are selected cases. His patients are soldiers between the ages of twenty and twenty-five. He therefore has excluded for him, by the rigid examination required before entering the army, the two dangerous extremes of life, all previously existing chronic complications, such as Bright's disease, heart disease, diabetes; and his patients are too young to show the later effects of alcoholism and syphilis in vessels, heart, brain, cord, liver, etc. With the favorable hospital surroundings and with these selected cases the mortality ought to be unusually low. Yet his statistics attract attention because of the early crisis and the tolerance of the enormous doses of digitalis, as well as for their favorable ultimate results.

Stimulated by Petresco's success, others have tried the digitalis treatment. Among these may be mentioned Fikl,[1] 1 death in 61 cases; Höpfel,[2] 1 death (a case of mitral stenosis) in 15 cases; Hecker,[3] 27 cases, with no death. Lépine[4] had good results in 40 cases, using digitalin. Danforth[5] reports 3 successful cases by the use of a normal liquid in which one drop represents one grain of the leaves.

Naegeli-Akerblom[6] had success with this treatment when he excludes cases that were hopeless because of late treatment or complicating disease. Recalling the fact that in pneumonia that terminates favorably there is commonly a pre-critical polynuclear leucocytosis (Tchistowitsch, Biegansky, von Jaksch, Kikodse, and others) Naegeli-Akerblom undertook experiments upon healthy rabbits and upon men, and found that large doses of digitalis produce a marked leucocytosis. He sees a connection between this hyperleucocytosis and the favorable course pursued by pneumonia under the digitalis treatment. The use of cold water in connection with digitalis is advised, as still further tending to induce leucocytosis.

Unfavorable reports are, however, not lacking. Leo Havas[7] found in 3 cases such evidence of toxic effects—nausea, vomiting, vertigo, mydriasis, muscæ, irregular pulse—that he felt forced to give up further trial. Löwenthal[8] admits that doses of forty to sixty grains

[1] *Wiener med. Wochenschrift*, 1891, Nos. 24 and 25.
[2] *Therap. Monatshefte*, April, 1892.
[3] *Militärärztl. Zeitung*, 1893, No. 1.
[4] Lépine (Lyon), *Semaine méd.*, January 20, 1892.
[5] Wilson's *Text-book of Applied Therapeutics*, article "Pneumonia."
[6] *Centralblatt für innere Medicin*, 1895, No. 32.
[7] *Pester Med.-chir. Presse*, 1894, No. 26.
[8] *Centralblatt für die gesammte Therapie*, November, 1891.

are not necessarily toxic, and may even improve the action of the heart. He failed, however, in 12 cases to be convinced of any specific effect of the remedy in pneumonia. Rechtshamer[1] found the large dose of benefit in some cases of pneumonia in the aged. In the young he believes the drug is often unnecessary.

Fixation Abscess.—Fouchier has devised a method that is, to say the least, novel. He injects under the skin from 15 to 30 minims of turpentine, producing in this way an antiseptic abscess. He believes that in this manner a suppurative process is "drawn away" from the lungs or is fixed at this new point. Whatever virtue there may be in this method of treatment—and it has received the sanction of two or three French clinicians (Lépine, Dieulafoy, Gingeot)—is probably to be explained, as Chantemesse has suggested, on the ground of the leucocytosis produced. This method has been condemned by the profession at large rather by being ignored and passed over in silence than by argument against it or clinical experience opposed to it. Ferrara, however, vigorously declares its uselessness.

Injection of Salt Solution.—Bollinger,[2] after studying the subject of pneumonia, has reached the conclusion that the cause of death is primarily through oligæmia, the blood being robbed by the process of exudation in the lung. Cardiac weakness is but secondary, being the result of poorly nourished myocardium. He suggests as a possible treatment, founded upon this hypothesis, the injection of normal salt solution. In a few cases successful results have been reported by this method of treatment, and normal salt solution combined with bicarbonate of soda has been injected, on the theory that it prevented coagulation of blood in the cavities of the heart.

Several other methods of treatment that are regarded by their advocates as closely approaching specifics might be mentioned. Among these is the treatment with chloride of calcium and the treatment by pilocarpine.

Symptomatic and Expectant Treatment.—The foregoing methods of treatment have been described, not because the writer believes that one or all of them are specific modes of treatment, but because in an article of this kind it is but justice that the various methods should be outlined. When one reads carefully of different methods of treatment of pneumonia, and sees the various claims that are made for different treatments almost diametrically opposed, and, above all, when one sees in hospital and private practice one line of treatment giving practically the same results as another line; when one sees on one side of a ward patients treated by so-called homœopathic methods, and on the other patients treated according to the best practice of the regular school, and sees these patients getting

[1] Abstract in *V. u. H. Jahresbericht*, 1895. [2] *Münch. med. Woch.*, 1895, No. 32.

well or dying in the same way on the one side as on the other, then one realizes that there is, as yet, no specific for the treatment of pneumonia. In fact, all physicians with large hospital practice have seen many a case of pneumonia get well without a single dose of medicine. It is, moreover, questionable whether there is any medicine that can modify or abort a case of pneumonia. More than this, many a patient has lost his life through improper medication or through over-medication rather than through natural causes. If we are to believe Dietl, he had 939 cases of pneumonia with practically no treatment, and a death-rate but little over 8 per cent. It is certainly a wrong practice to prescribe in a routine manner ammonium carbonate, aconite, veratrum viride, chloride of calcium, whiskey, morphine, bleeding, merely because we have made a diagnosis of pneumonia. This is not a new statement, and yet it bears repetition, as its truth is frequently forgotten in practice. In the absence of any specific treatment the therapy must be expectant or symptomatic. To repeat: Many a patient needs no prescription at all, except perhaps for politic reasons or to satisfy friends.

While, therefore, admitting that there is no abortive treatment for pneumonia, no specific treatment for the disease, and while admitting that the proper treatment, according to our best knowledge to-day, is the expectant and symptomatic treatment, it must not be understood that nothing can be done for a case of pneumonia, and that the outcome is to depend entirely upon the *vis medicatrix naturæ*. We can, as Jürgensen so forcibly pointed out, try to support the powers of life until nature shall effect a cure; we can see to it that our patient is put in the best possible condition to withstand the storm; we can see to it that we avoid all dangers that we know threaten in this disease. Many points that merit more extended discussion will be briefly alluded to, as they have been fully discussed in the excellent article by Graham in the earlier volumes of this work.

The Room.—The room in which the patient lies should be light, airy, and well ventilated. If there is any one disease in which an abundance of pure air is needed, it is pneumonia. There is a lesson in the story that is told of one of our Chicago physicians who, entering a tenement-house to see a case of pneumonia in consultation, before proceeding to the examination of the patient or to a formal consultation broke out a few panes of glass with his umbrella.

Rest.—In this disease, as in diphtheria, there is the greatest necessity for impressing upon patient and upon nurse that rest in bed is essential. The great danger of cardiac failure is too well known to be referred to at length. This danger, it must be remembered, does not leave with the crisis. Not a few lives have been lost because of a little carelessness on the part of friends or nurse

after the crisis has been passed. I have known a patient to fall back dead when reaching over to get a cup of coffee from the table placed by the side of his bed. In one of my ward cases a patient who came in late at night, apparently not very ill, and who was not examined, was allowed to go to the closet, where he fell dead. The autopsy showed a lobar pneumonia of the middle lobe.

Diet.—While care should be exercised as to the diet in pneumonia, there is not so great a necessity of being particular as in cases of typhoid fever. A patient with pneumonia can be allowed to partake freely of milk, of broths—in fact, of any liquid food. There is no objection to meats that are easily digested being taken. So, too, bread, toast, eggs, even some starchy foods, may be allowed in moderate quantities. There is danger, however, in this disease of over-feeding the patient, just as there is danger of over-feeding in typhoid. When the stomach is rebellious, when there is a tendency to diarrhœa and fermentation, the diet should be carefully watched, and it may be well for several hours, or even for an entire day, to allow but little, if any, food. A patient with pneumonia should be allowed to take water freely. It satisfies thirst, tends to keep the bowels, the kidneys, and the skin in free action. There is no reason why a pneumonic should not be allowed plenty of water.

Local Applications.—The question of poulticing the chest of a pneumonic always comes up. Among the laity it is still regarded as the proper thing to do, but there is probably more danger from poulticing the chest than from omitting to do this, unless a large poultice, carefully applied, frequently changed, and patiently watched, so that it does not cool and does not slip, can be employed. This is seldom, in practice, feasible. A much simpler, neater, and, we believe, as efficient, application is that of the cotton jacket. Just how a cotton jacket acts is perhaps not clear, but certainly many intelligent patients claim that they feel more comfortable after the cotton jacket has been on for a few hours than they did before.

Disposal of Sputa.—It will not be amiss to repeat the statements already made as to the necessity of prophylaxis. The nurse should be instructed as to the proper disposal of the sputum. This lessens the liability of the contraction of the disease by nurse or by other attendants. Sputum-cups, and handkerchiefs that can be burned, should be employed.

Fever.—High temperature in pneumonia, which is a disease ordinarily running a short course, is not of necessity bad; in fact, some, as Cantani, regard a high temperature as beneficial. Statistics of pneumonia seem to show that those cases do best where the temperature ranges between 103 and 105°. Patients with temperature above 105° usually do poorly; patients with temperature between 100°

and 103° also do poorly. Where the temperature, however, remains above 104°, particularly if, at the same time, there is nervous disturbance in the shape of delirium and restlessness, with bounding pulse and hot, dry skin, the reduction of the temperature is of advantage. Several different ways of reducing temperature in pneumonia are advocated. By many (Jürgensen, Ziemssen, Bartels, and others) the cold bath is advocated. Others rely upon sponging or upon the cold pack; still others apply ice to the chest for the reduction of temperature; and this method, as has been stated, is believed by many to be not alone efficacious in the reduction of temperature, but aids in jugulating the disease.

Two classes of remedies have been at various times advocated—the antipyretics of the coal-tar series and aconite and veratrum viride. The use of the latter drugs should be restricted to the early stage of the disease, and will be discussed under the head of the Heart. Quinine as an antipyretic has been almost entirely discarded. A great deal has been said against the use of the coal-tar antipyretics in the reduction of the temperature in the acute infectious diseases, including pneumonia. There can be no question that harm can come from the giving of these remedies. Cyanosis and collapse may occur. But when it is found in a pneumonia that sponging fails to reduce temperature, when the pulse is full and strong, the skin dry and hot, the patient restless, a moderate dose of acetanilid, of phenacetin, or of antipyrin is in order. A great many practitioners are in the habit of giving far too large doses, and for this reason toxic effects have been noted. Two grains of acetanilid, three grains of phenacetin, and four or five grains of antipyrin should be the ordinary dose for a strong, vigorous adult. When one sees ten and fifteen grains of acetanilid given at a dose, and ten grains of phenacetin as the ordinary dose, it seems no wonder that there is a prejudice among the profession against the use of these remedies. By the giving of two grains of acetanilid a temperature of 105° can frequently be reduced to 101°. At the same time, the pulse will drop ten or fifteen beats and lose its angry quality; the skin becomes moist, the delirium disappears, the patient drops off into a quiet, refreshing sleep. Symptomatically, at least, the remedy has done good. In case the temperature an hour and a half after the administration of the antipyretic has not subsided, the dose can be repeated. Not infrequently a small dose of codeine and a small dose of caffeine citrate can be combined with the acetanilid, which is, perhaps, the best of the remedies mentioned.

Pain.—One of the most troublesome symptoms to combat in cases of pneumonia is the pain. Many local measures have been recommended for its relief. Probably the very best is the local abstraction of a little blood by means of a few leeches. Ice to the chest will also

relieve pain; so will hot applications if kept continuously applied. A counter-irritant or blister is frequently employed by many physicians. In some cases strapping of the chest, as is done in cases of fracture of the rib or of simple pleurisy, can be employed. The very best method, however, for the relief of pain is the use of opium in some form. Codeine in one-quarter to one-half grain doses will sometimes be efficient. Severe pain demands the use of stronger preparations of opium, either the use of Dover's powder or, better still, the use of morphia hypodermically. It has been frequently said of late, as regards bloodletting in pneumonia, that the pendulum has swung too far in one direction. The same may be said, I believe, as to the use of opium. There is certainly a too strong prejudice in the minds of many practitioners against the use of opium because of its interference with the function of respiration. There are many cases of pneumonia in which opium in some form should be given, and should be given heroically. Where a patient is suffering from severe pain which interferes with the act of respiration, and thus with proper oxygenation, which prevents sleep and which makes him more nervous and restless than before, it is idle to trifle with simpler and less efficient remedies. Morphine should be given hypodermically in sufficient doses to relieve the pain. The patient will sleep, he will lose his restlessness, the pulse will become stronger, the breathing will be better, and in every respect his condition will have been improved.

Cough.—For the cough of pneumonia it is perfectly useless, or worse than useless, to give the ordinary nauseating expectorants. The various syrups, the carbonate of ammonium, the chloride of ammonium, tartar emetic, and all that class of remedies are worthless. The best remedy to employ when cough is so persistent as to keep the patient awake and to keep him excessively nervous is codeine in $\frac{1}{8}$ to $\frac{1}{4}$ grain doses, or morphine. Codeine is preferable, because it can so frequently be repeated without danger, and because it is less liable to upset the stomach and bowels. Bartholow recommends for cough, as well as for the heart and dyspnœa, the inhalation of iodide of ethyl, twenty to thirty drops upon a handkerchief.

Dyspnœa and Cyanosis.—For the dyspnœa and cyanosis in the early stage bleeding is probably the very best treatment. In the latter stage, where there is right-heart dilatation with consequent cyanosis, bleeding is recommended, but very few cases are recorded where much good has come from bleeding at this late stage. The good effect of the cathartic is sometimes seen in these cases, particularly where the bowels have been constipated for two or three days and where there is much tympany. The cyanosis and dyspnœa frequently depend upon cardiac weakness, when the treatment should be that outlined in the next paragraph. The use of oxygen has been

warmly recommended, and in these recommendations the writer fully concurs. Where the cylinders of oxygen can be obtained in our larger cities, and among patients who can afford this luxury, it can be given every few minutes or even continuously, pure or diluted. The effect in some cases is quite marked. There is an improvement in the pulse and in the color. The patient may drop off into a quiet, refreshing sleep.

Heart, Pulse, Stimulation.—Whatever theories one may hold regarding the pathology of pneumonia or the cause of death in this disease, all are agreed that there is great danger from cardiac weakness. Jürgensen's strong statement is that the object of treatment should be to sustain the heart until nature effects the cure. There is great necessity for careful watching throughout the entire course of the disease. A pulse that remains steady and strong as the disease progresses is one upon which a favorable prognosis can be based, though many of the other symptoms, as temperature, may seem to be unfavorable.

Early in the disease bloodletting will cause a slowing of the pulse and a loss of the angry quality, showing that the heart has been relieved of the excessive work placed upon it. Those who advocate venesection advocate it as an early, and not as a late, measure. There are many who believe that bloodletting is not necessary when we have at our command the two therapeutic lancets, aconite and veratrum viride. A patient can be just as well bled into his own veins as into a basin, is the statement of these physicians. The use of these remedies—aconite and veratrum viride—is, however, not without danger. Blood-pressure is relieved largely through a weakening of the cardiac beat, and this would seem to be contraindicated in pneumonia. Where aconite or veratrum viride are given in moderate doses and the effects carefully and intelligently watched, they may do good, but in the hands of patients and of many practitioners they are certainly capable of doing much harm. I have known ten drops of veratrum viride to be given every two hours for three days; at the end of this time the pulse was 90, gaseous and weak; the heart sounds were scarcely audible. The patient was cyanotic, had been vomiting at intervals for two days. Notwithstanding the stopping of the veratrum viride and vigorous stimulation, he died a few hours later. While the writer has not, perhaps, used veratrum viride as faithfully and intelligently as he should, he has never seen any benefit come from its employment.

One of the very best cardiac stimulants is strychnia. This can be begun whenever the heart is found to be growing a little more rapid and a little more weak day by day. It is best to give the strychnia in small doses early, and in this way to fortify the heart,

than to give the remedy late and when cardiac weakness has become marked. One-sixtieth of a grain of strychnia can be given in pill form or in solution once in six hours. This is a dose that can readily be increased by increasing its frequency, as occasion demands, until one-sixtieth of a grain is given every two hours or until one-thirtieth of a grain is given every three hours. Where there is irritability of the stomach or where the absorption is questionable the drug should be given hypodermically.

Digitalis is a remedy that certainly has a place in stimulating the heart in pneumonia, even though we may not employ the enormous dose advocated by Petresco. Given on the fourth or fifth day, when there are symptoms of cardiac failure, it will be found in many cases of great service. Caffeine is a remedy that is advocated by some. Where collapse occurs, particularly at the time of crisis, hypodermic stimulation by the aromatic spirits of ammonia, ether, and strychnia may sometimes carry a patient through this most dangerous period.

There is among the profession still some question as to the value of whiskey (or, more strictly speaking, alcohol) in the treatment of pneumonia. Probably all are agreed that in alcoholic pneumonias the sudden withdrawal of whiskey, the poison to which the patient has been accustomed, is liable to be followed by dangerous cardiac weakness. Under these circumstances whiskey should certainly be given. It is the testimony of most physicians that in cases of pneumonia where there is great toxæmia, where the patient is in a typhoid condition, delirious, or stupid, with parched tongue, rapid pulse, twitching tendons and involuntary discharges, alcohol in some form should be given. The good effects are seen when the patient becomes more quiet, the tongue becomes moist, the pulse improves in quality, the muscular twitchings diminish. An increase in delirium generally means that the alcohol is poorly borne or is in too large dose. When whiskey is given and the good effects are manifest, it should be given in full doses. Half an ounce every four hours, every three hours, or every two hours should be given day and night. Wilson Fox gave in one night twenty ounces to a pneumonic. Particularly as the time for crisis approaches should the heart be carefully watched, and the nurse should have instructions that if, as the temperature drops, the pulse becomes weak and rapid instead of becoming slow and strong, she should give hypodermically strychnia and apply heat externally and should give an additional dose of alcohol internally. As regards the use of alcohol, it may be said here that most pneumonics will go through the course of the disease without alcohol, but when it is indicated it should be used, and used fearlessly.

Delirium and Insomnia.—For the delirium of pneumonia an ice-cap is sometimes beneficial. In many cases, too, as the temperature is lowered by some of the methods previously described the delirium disappears. When other means fail a hypodermic of morphia will quiet the patient and permit of sleep. Balfour gives to almost all of his pneumonics digitalis and chloral, finding in this combination a quieting remedy and at the same time one that stimulates the heart. Chloral is frequently well borne by these patients, and, particularly if fortified by digitalis or strychnia, need not be feared. It is sometimes necessary to give it *per rectum*. The other hypnotics that may be used to quiet delirium and to induce sleep are sulphonal and trional. Both these remedies are sometimes quite slow in their action. The sulphonal can be dissolved in hot water or given in a cup of hot tea. The trional is best given dissolved in water by the addition of a little alcohol. The action in this way is much more rapid than if given in capsule or in powder. The best dose of trional is about ten grains.

The Bowels and Stomach.—But little need be said as regards the symptomatic treatment of the stomach and the bowels. If we remember the danger of overdosing patients, if we remember the danger of overfeeding patients, we shall not make the mistake of still further irritating an already irritable stomach by giving too much medicine or too much food. Diarrhœa, at times, may be so pronounced as to need some simple astringent. Tympany, too, may be present in cases of pneumonia and may demand the ordinary treatment, such as the induction of free catharsis, the giving of enemata containing turpentine, or the passage of the rectal tube. Abdominal pain is not of necessity an indication of involvement of the peritoneum, but is more commonly due to involvement of the diaphragm. This should be treated by the ordinary methods of treatment of pain as indicated before. Ten or fifteen grains of calomel at a time when crisis seems to be impending sometimes seems to favor its early occurrence.

The Kidneys.—Even in cases where there is involvement of the kidneys in acute inflammation little in the shape of medication is demanded save a free allowance of water. Where the kidneys, however, are found to be acutely inflamed, as occurs in a certain percentage of pneumonias, the use of remedies that would irritate the kidneys should be carefully avoided.

Resolution.—The treatment of the stage of resolution needs but a few words. Ordinarily, tonics, good diet, and, as the patient gains in strength, fresh air and exercise, are all that is required. Pilocarpine has been recommended at this stage. One of the remedies that seems to aid absorption is iodine, either in the shape of the iodides or applied locally. It should always be remembered that symptoms of delayed

resolution may sometimes be simulated by pleural exudates. If these are present, the proper treatment for an exudate should be instituted, rather than the treatment for a delayed resolution.

BRONCHO-PNEUMONIA.

Broncho-pneumonia is generally regarded as a disease distinct from croupous pneumonia. It is characterized by a bronchitis to which the pneumonitis is commonly spoken of as secondary, by peribronchial inflammatory nodules or large masses that are rarely lobar in their extent, and by secondary atelectasis. As compared with the croupous form, there is a comparative lack of fibrin in the exudate, together with other microscopic differences, a different clinical course, different etiology, and different bacteriological findings.

Broncho-pneumonia is a microbic affection. Various organisms have been found in different cases, at times in pure cultures, but frequently associated. The ones commonly found are the pneumococcus of Fränkel, the streptococcus pyogenes, the bacillus of Friedländer, and the staphylococcus pyogenes. The bacillus of diphtheria is often found in cases complicating pharyngeal or laryngeal diphtheria, and has been found as well where no diphtheritic exudate was present in the upper respiratory tract. These organisms are among the commonest pathogenic organisms found in the nose, throat, and buccal cavities of healthy individuals (Netter, Pasteur, Sternberg, Thost, and others). This suggests strongly the probable source of infection. Carried by air, by inhaled particles of dust, saliva, or mucus into the bronchi and lungs, these bacteria will excite inflammation if they themselves possess the requisite degree of virulence, or if the soil be favorable. Further, any condition—*e. g.* the suppression of the act of coughing—that favors their retention in the lower air-passages will favor their growth. When, therefore, the nose, pharynx, and buccal cavity are particularly foul and unclean, when the bronchial mucous membrane is in such condition as to furnish a fertile soil, and when local or general causes favor the lodgement and retention of bacteria within the air-passages, we should expect the development of bronchitis, bronchiolitis, and broncho-pneumonia.

Broncho-pneumonia in Acute Infectious Diseases, in Infants and in the Aged.—Clinical facts bear out these observations. Broncho-pneumonia is most common when the bronchial tubes are already inflamed and in a favorable condition for the reception of the above-mentioned germs. In children whooping cough and measles are not infrequently complicated by broncho-pneumonia, causing a large per-

centage of the deaths from these two diseases. Here the primary disease is to be looked upon as the predisposing cause, and the pathogenic germ—the pneumococcus, the staphylococcus, etc.—as the exciting cause. Scarlet fever, diphtheria, typhoid fever, small-pox, erysipelas, may in like manner be complicated by this affection. The inability of a child to cough and to rid the tubes of mucus and organisms is the reason the young child or the infant is more liable to be affected than the older, stronger child, who by coughing gets rid of the dangerous material. In typhoid fever, when the nerves are dulled and blunted, the patient gives no heed, though mucus be present in the bronchioles and bronchi. The patient lying often upon his back, the secretions accumulate in the posterior part of the chest. The inspired air, passing through a foul mouth, nose and pharynx, is polluted with numerous organisms that enter the bronchi and vesicles. The conditions are therefore ripe for a broncho-pneumonia—a hypostatic pneumonia. In the aged, too, particularly when afflicted with some debilitating disease or confined to bed, broncho-pneumonia is of not uncommon occurrence. "In certain epidemics due to the pneumococcus, where lobar pneumonia and broncho-pneumonia coexist, it has been noted that the first disease attacks the robust, vigorous, adult subjects, the latter the infants and the debilitated."[1] Children, the subjects of rickets or with deformed chests; weak persons, the subjects of an acute or chronic bronchitis, are especially liable to be attacked with this affection.

Aspiration Pneumonia.—According to the view just advanced, every broncho-pneumonia is practically an inhalation or aspiration pneumonia—*i. e.* due to the inhalation of pathogenic germs. But a separate class is commonly made of the so-called "deglutition pneumonias" that includes those cases where some large foreign material, as a piece of food, vomitus, a plug of dried mucus, etc., has been inhaled, lodged in the bronchioles, and has become the focus of peribronchial inflammation, leading oftentimes to suppuration. Any local or general condition causing the patient to be unconscious of the presence of the foreign body, or unable to extrude it by coughing, will tend to produce a pneumonia of this kind.

Becker[2] has divided these cases into three groups:

(*a*) Cases in which there is a condition of marked apathy, somnolence, or unconsciousness from whatever cause. It may be uræmic, diabetic, due to cerebral concussion or compression, as in the case of tumor, abscess, hæmorrhage, or fracture; it may be the narcosis from an anæsthetic. If under any of these circumstances vomiting occurs, masses of vomitus may remain in the pharynx and with the next

[1] Netter, *Charcot's Traité de Médecine*, vol. iv. p. 934.

[2] "Aspirations-pneumonie," *Inaug. Thesis*, Göttingen, 1887.

inspiration be carried into the respiratory tract, there to act as irritants, and, through the bacteria carried with them and following them, to be the excitants of lobar pneumonia. Many deaths attributed to an accidental pneumonia following an operation can be traced to the inhalation of vomited material during the anæsthesia.

(*b*) Cases occurring in consequence of paralysis of the recurrent nerve. Through paralysis of the adductors of the larynx the entrance of food-particles is favored and the anæsthesia of the trachea and larynx favors their retention by preventing the expulsive cough. The experimental vagus-pneumonia comes under this head.

(*c*) Cases in which the foreign material does not gain entrance through the pharynx and larynx, but through some new opening. A common cause here is the perforation of a carcinoma of the œsophagus; less commonly the perforation into a bronchus of an empyema or hepatic abscess. Suppuration or gangrene frequently occurs in these cases.

Tubercular Broncho-pneumonia.—This is a form not always readily recognized. It should be suspected when evidence of lobular consolidation is present in patients known to be tuberculous and when —*e. g.* following pertussis—the disease hangs on week after week with steady loss of strength of the patient. In other cases an apparently typical lobar pneumonia fails to resolve, and later the formation of cavities or the presence of tubercle bacilli reveals the nature of the disease. Most of these cases are tubercular from the beginning. In some instances tubercular infection may be a secondary process. Osler has laid particular stress upon the existence of a tubercular form of broncho-pneumonia and the importance of recognizing it as influencing materially both prognosis and treatment.

Treatment.

Prophylactic Treatment.—Much can be done to avoid a broncho-pneumonia. A child that is suffering from bronchitis can be kept indoors on stormy days. The feet can be so protected that they do not become wet; extra wraps can be put on when the child goes out into the cold. The child should be watched carefully at night to see that it does not kick the clothes off, and by preference flannel night-clothes should be worn. This extra care should be exercised, particularly during and after convalescence from measles and whooping cough.

In typhoid fever and in other diseases in which the patients are in a typhoid state careful attention to the mouth may avoid a complicating broncho-pneumonia. If the mouth be carefully cleansed with antiseptic solutions, so that the inspired air goes through a cavity that is contaminated as little as possible with pathogenic

organisms, it diminishes the danger of this complication. Again, frequent change of position in typhoids may serve to avoid a hypostatic congestion with consequent pneumonia. One of the benefits of the Brand method of treatment by cold baths is that it induces patients several times a day to change their positions and to take deep inspirations, often followed by coughing, and in this way to rid the bronchial tubes of mucus and dilate the collapsed air-vesicles.

In diphtheria, and particularly after tracheotomy and intubation, it is said that elevating the foot of the bed prevents, by gravity, fluids from entering the lungs, thus lessening the danger of lobular pneumonia. Seymour of Troy, who has advocated this method, believes that his results after intubation have been better since adopting this treatment.

Active Treatment.—The room in which the patient is kept should be bright and airy, and, where possible, at least one thousand cubic feet of air should be allowed to each occupant. The temperature of the room should be between 68° and 70° F.; some say even a higher temperature than this is preferable. It is generally regarded as good practice to have the air of the room moist. This result is obtained by hanging up sheets wrung out of water or by keeping a kettle of water constantly boiling. Many recommend also the slow evaporation of creasote, of turpentine, or pine-needle oil, believing that the vapors are of benefit in these bronchial affections. Others object to this procedure, believing that the practice of filling the air of the room with steam and the vapors of antiseptics is in itself depressing.

Local Applications to the Chest.—The time-honored poultice has been almost discarded by the majority of practitioners, at least in our large cities. Where the poultice can be neatly applied over the entire affected area, where it can be changed frequently enough to be kept hot, there can be little doubt that it makes the patient more comfortable, to say the least. But it is rare that we can have the combination of suitable patient and suitable nurse, so that we feel justified in advising the use of the poultice. The cotton jacket, by keeping in the heat of the body and the sweat, really answers every purpose, securing heat and moisture. A less cumbersome jacket can be made by covering the under-shirt on the outside with oiled silk. The shirt should be previously opened down the front, so that it can be slipped on and off easily. Local bloodletting by leeches is now advised by but very few. Mild counter-irritation, as by camphorated oil or oil and turpentine, is in order. Some quite regularly apply stronger counter-irritation. Thus Holt advises the use of mustard and flour as a paste or poultice, left on long enough to redden the skin and repeated several times daily.

Diet.—Water should be allowed freely for its diuretic and diaphoretic effect. According to the age of the child, it should be nursed from the breast, or be given milk previously peptonized, ordinary cow's milk, or liquid diet. Older patients may be given a light diet, the same as in cases of lobar pneumonia. It is wrong to force food into a child or older patient when the stomach is irritable and is occasionally rejecting food by vomiting. This is particularly the case in broncho-pneumonia, for much depends upon the integrity of the stomach and of the bowels; for broncho-pneumonia, unlike lobar pneumonia, frequently lasts for many days or several weeks, and to maintain the strength of the patient the stomach and bowels must be in good working order both for the reception of food and of medicine.

The Bowels.—An initial dose of calomel or castor oil should be given. This can be repeated at any time during the course of the disease. A distended colon is not only a source of discomfort to the patient, but, in children particularly, may be the cause of cyanosis, impaired respiration and nervous excitement. Even convulsions have been attributed to this condition. Cathartics should therefore be used often enough to keep the bowels open, or enemata can be given to rid the bowel of the accumulation of gas. It is to be remembered, too, that in pneumonia of children the mucus that is expectorated is swallowed. This may be rejected by vomiting or it may enter the intestine. A cathartic will sometimes bring away a large amount of this mucus; that must not be looked upon as necessarily indicating a catarrhal condition of the bowel.

Baths, Sponging, Antipyretics.—No definite rules as to the use of antipyretic measures in broncho-pneumonia can be given. The thermometer should not be the only guide for the use of these measures. Each child in this particular is a law unto itself. A temperature of 105° in one child may cause much less disturbance and be less a source of danger than a temperature of 103° in another. We must be guided in the use of antipyretics as much by the existence of delirium, restlessness, tendency to convulsion, character of the pulse and dryness of the skin as by the actual temperature. The best method of reducing temperature in children is ordinarily by the sponge-bath or by the pack. Where the temperature is high and stubborn and there are marked constitutional disturbances, a cool bath may be given with great benefit. There is considerable prejudice among the profession against the use of the coal-tar products for the reduction of temperature; but in children they are particularly well borne. Where it is found that the use of water is disagreeable, resisted by the child, or is without results in reducing temperature, antipyrin, phenacetin, or acetanilid can be given. The effect of this in proper doses is usually marked and beneficial. The temperature falls,

the pulse becomes slower and quieter, the restlessness ceases, the child drops to sleep, the skin becomes moist. In children antipyrin is often the best preparation to give, because of its solubility. It may be combined with bromide:

℞. Antipyrin., gr. xxiv (1.6);
Sodii bromidi, gr. xlv (2.65);
Syrupi lactucarii, ʒij (60.0).—M.
Sig. Take one-half teaspoonful for restlessness.

A child of four to six years can take about two-thirds of a grain of acetanilid.

Aconite by some is regularly employed, particularly in the early stages of these pneumonias. Here it is perhaps of some benefit, but it is a somewhat dangerous drug to put into the hands of parents, and its beneficial effects are questionable.

Cough, Expectorants, etc.—Expectorants in general are harmful. Carbonate of ammonium, if given in doses large enough to have an expectorant effect or a stimulant effect upon the heart, is not well borne. Squills, ipecac, senega, are useless. Yet at times large enough doses of ipecac can be given to induce vomiting, and in this way rid the bronchial tubes of accumulated mucus. Chloride of ammonium is frequently given as a routine treatment, but the benefits from it are questionable. Where the cough is excessive, evidently painful, and is keeping the patient awake, codeine tablets or the phosphate of codeine in solution can be prescribed. Tully's powder is a favorite method of giving opium with some, as is paregoric with others. It is perhaps needless to give the caution that all opiates to children should be given in proportionately smaller doses than to adults.

For the relief of cough several vapors have been advocated. Reference has already been made to the use of creasote in the room, and of turpentine or benzoin. The lamp that is known as the vapo-cresolene lamp is of great benefit in whooping cough, and will be found at times to relieve the coughing spells, particularly those that occur at night, of bronchitis and broncho-pneumonia.

Swift,[1] at St. Mary's Free Hospital for Children in New York, uses chloride of calcium, 2 to 5 grains every two or three hours. He believes that in pneumonia, particularly of the lobar type, it may in a measure jugulate an attack, and is sure that it aids expectoration. It has at least, as he says, the virtue of being harmless.

Stimulants.—It is not wise in broncho-pneumonia, any more than in lobar pneumonia, to give stimulants until there is special indication for the same. Alcohol is used by almost every practitioner in

[1] *Archives of Pædiatrics*, April, 1896.

severe cases of broncho-pneumonia. This can be given in the form of brandy or whiskey diluted with water. In the case of small children, who object to the taste and smell of the whiskey or brandy, Cologne spirits or deodorized alcohol may be substituted. The dose must be governed by the age of the child, the severity of the case, and the effects noted after the administration of the remedy. Strychnia is one of the best heart and respiratory stimulants. It can be given to a child in a little camphor-water, when the bitter taste will scarcely be noticeable. A child of one year can take gr. $\frac{1}{300}$ every six to every two or three hours. Digitalis should be prescribed only as indicated by the condition of the heart. For sudden cardiac failure or collapse nitro-glycerin is probably the best remedy. Aromatic spirits of ammonia may also be given. The objection to digitalis, that it contracts peripheral blood-vessels, may be overcome, in some instances at least, by combining digitalis with nitro-glycerin. The former drug strengthens the heart's action, the latter dilates peripheral vessels, and in this way a congestion of the pulmonary vessels may be in a measure relieved. The infusion or tincture of digitalis can be combined with the spirits of glonoïn—*i. e.* a 1 per cent. solution of nitro-glycerin.

When cyanosis becomes more pronounced and the strength of the child fails, when respiration is performed with great difficulty and the child is seen to be rapidly losing ground, stimulating measures should be instituted. A hot bath of a temperature of 103–105° F. can be employed, or the child can be placed alternately in hot and cold water. In this way the respirations are sometimes stimulated. Under these circumstances, too, the use of oxygen may be of benefit. Belladonna has seemed to me in some cases to be of service under these circumstances. If it can be given in half-drop or drop doses every thirty minutes and carefully watched until the pupils dilate, there will sometimes be seen an improvement in the respiration. It probably acts by relieving spasm in the bronchioles and by acting as a respiratory stimulant.

Resolution.—Where there is a delay in resolution one of the best remedies is cod-liver oil and fresh air. Holt[1] says: "It has been our experience that the protracted cases lasting over a month are almost invariably fatal in the hospital, but often recover when transferred to the country convalescent home." It is in this stage, too, that tonics are of benefit. Iodine can be applied locally. The syrup of the iodide of iron is also of great service at this time.

After all that has been said regarding the treatment of broncho-pneumonia, it can be summed up in a very few words by saying that the treatment is rest, fresh air, nourishment, local applications, and,

[1] *Archives of Pœdiatrics,* April, 1896.

where needed, alcohol, strychnia, codeine, with perhaps vigorous stimulation to tide the patient over the impending collapse.

PLEURISY.

The question of the etiology and treatment of pleurisy has been so critically and completely discussed by Matas in his article in Vol. II. that the present writer will merely touch upon a few of the more important points that have been brought out in the four years since that article was written. Some repetition will be unavoidable.[1]

I. Fibrinous, Plastic, or Dry Pleurisy.

This form of pleurisy may follow exposure to cold, particularly in the case of debilitated subjects or in those of a rheumatic diathesis. In Bright's disease, diabetes, and other depressing diseases a dry, plastic form of pleuritis may occur. Whether this is due to chemical or microbic causes is not definitely known. Acute, localized, dry pleurisy may be due to tuberculosis. Accompanying inflammatory and neoplastic processes in the lungs, a secondary pleurisy is common, as in pneumonia, pulmonary abscess, cancer, gumma, gangrene, infarction, or tuberculosis whenever the disease reaches the surface of the lung.

The treatment of this condition will vary somewhat with the cause. The relief of pain is the main indication. Hot fomentations are commonly sufficient. At times the chest may be strapped as for fractured ribs, three or four long strips of adhesive plaster about two inches in width being tightly drawn about the affected side and passing beyond the median line both in front and behind. These strips should be neatly and evenly applied, overlapping in shingle fashion, and should be put in place during a forced expiration. Blisters, leeches, painting with tincture of iodine, may give some relief. The severity of the pain will at times demand morphine. In the cases where there is reason to suspect a rheumatic origin salicylates and alkalies can be tried.

De Cérenville[2] of Lausanne injects one to three cubic centimetres of sterilized olive oil into the pleural sac. He claims that the injection is not difficult and that the relief is prompt.

II. Acute Sero-fibrinous Pleurisy, or Pleurisy with Effusion.

These forms of acute and subacute pleurisy are classed, according to latest views, under the head of microbic affections. Cold and

[1] See also article by McCosh in this volume.

[2] Abstract in *Annual of the Medical Sciences*, 1896.

trauma are looked upon as but predisposing or favoring causes. Debilitated conditions and conditions of toxæmia—*e. g.* Bright's disease, diabetes, cirrhosis of the liver, or malignant growth—lessen the resisting power of the body and encourage the development of the organisms. It is impossible to exclude chemical—*i. e.* toxæmic—causes for some of the cases. The possibility of a primary toxic cause, with a secondary microbic affection, has also to be considered.

Various organisms have been detected in the exudate. Among the commoner of these are the pneumococcus of Fränkel, the streptococcus, the staphylococcus, the tubercle bacillus.

Tubercular Nature of Pleural Effusion.—There has been a decided tendency among clinicians, bacteriologists and morbid anatomists to look upon the great majority of serous pleural effusions as of tubercular origin. The hereditary history, the previous personal history, co-existing evidences of pulmonary or peritoneal tuberculosis, the subsequent histories of these patients, the autopsy, the tuberculin test, the bacteriological examination of the fluid, have been the grounds upon which numerous observers have reached the conclusion that a large number—a large majority, some say—of serous pleurisies are tubercular. Among those who report large percentages of tubercular pleurisies may be mentioned Netter, Eichhorst, Landouzy, Ricochon, Kelsch and Vaillard, Chauffard, Levy, Prince Ludwig Ferdinand, Jakowski, Aschoff, Thue, Sejournet, and others. Aschoff[1] concludes that the so-called idiopathic pleural exudates are almost without exception of a tuberculous origin.

A mistake is not uncommonly made by physicians in examining a pleural exudate and excluding tuberculosis because the bacilli are not found. It is the exception to find the bacilli in cover-slip preparations. Few culture experiments are successful, and a negative result in an inoculation experiment is by no means conclusive evidence against the tubercular origin of the pleurisy. It is said that 32 per cent. of inoculations with tubercular exudates give a negative result.[2] In this connection Eichhorst's[3] experience may be instructive. In a series of cases he tried inoculations with the serous exudates, but was unsuccessful in inducing tuberculosis in the animal, though he was sure in some of the cases that the fluid had been taken from a tubercular pleural cavity. In a second series, however, he used a larger quantity, 15 c.c. instead of 1 c.c. in his injections into the abdominal cavity, with the result that tuberculosis developed in 65 per cent. of the animals. These views are held by the majority of the French school. Germain Sée expresses perhaps the strongest

[1] "Zur Aetiologie der serösen Pleuritis," *Zeit. f. klin. Med.*, Bd. xxix. S. 449.

[2] Aschoff, *loc. cit.*; also Netter, *Charcot's Traité de Méd.* vol. iv. p. 981.

[3] *Correspondenzblatt für Schweizer Aerzte*, 1895, No. 13.

sentiments when he "regards pleuritics as patients afflicted with tuberculosis in an evolutionary stage, and recommends that they should be treated in the same manner as consumptives."[1]

The more one investigates cases of sero-fibrinous pleurisy, and the longer one's patients are under observation, the more do clinical facts and the subsequent histories bear out the notion that the "idiopathic" pleurisies are very largely tubercular. The subsequent histories of cases observed by Fiedler, Barrs, Ricochon, and Bowditch showed a surprisingly large number with later unmistakable tuberculosis. Osler, while apparently hesitating to accept fully the conclusions of the French, admits that the more he has studied the question the larger does the proportion appear to be of primary pleurisies of tuberculous origin.[2]

Suppuration in Effusion.—Do all pleurisies in which the so-called pyogenic organisms are found go on to suppuration? The correct answer to this question is not easily given. Aschoff, in the article from which quotation has already been made, in examining the exudates from 200 cases found 7 in which a positive result was obtained from a bacteriological examination. Two died soon after, and no autopsy was permitted. The remaining 5 went on to suppuration. Two had contained the pneumococcus and 3 the streptococcus. He reaches the conclusion that all or nearly all exudates in which pyogenic organisms are found will sooner or later show pus. As a possible exception is to be mentioned the pneumococcus exudate. The early death of the organism (*vide* article Pneumonia, p. 328) may account for the relatively benign course of these cases.

Other observers (Prince Ludwig Ferdinand, Goldscheider, Levy) observed cases in which no purulent metamorphosis occurred, though the pus-producers (streptococcus, pneumococcus, staphylococcus) had been demonstrated in the fluid. Almost all these observers agree that an exudate, in a so-called "idiopathic pleurisy," that is free from organisms in cover-slip preparations and that gives a negative result in cultures, is presumptively tubercular.

A case is to be regarded as *rheumatic* only when in connection with an acute rheumatic arthritis or in one who has had recurring attacks of rheumatism. In almost every instance, too, the endocardium or pericardium will be found involved.

A pleurisy, with or without effusion, occurring in *syphilitics* has been described by several writers (Chantemesse, Prätorius, Nikulin). It may be present during the secondary stage or later, and may be insidious or frank. It can be regarded as due to the efflorescence on the pleura of lesions similar to those on the skin, to a periostitis, or to

[1] Abstract in *Annual of the Medical Sciences*, 1893.

[2] *Practice of Medicine*, 2d ed., p. 593.

a pleural lymphangitis. Several observers agree that in some cases that have resisted ordinary treatment the rapid clearing up of symptoms under anti-syphilitic treatment is proof positive of the specific character of the inflammation.

Pleuritic effusion of a serous character may complicate or follow *pneumonia* and contain the pneumococcus. A very few cases of primary pneumococcal pleurisy with effusion not complicating pneumonia have been reported.

In *typhoid fever* the Eberth bacillus has appeared to cause a pleural exudate that was not purulent. A pleurisy in typhoid not infrequently suppurates, and is due to the ordinary pyogenic organisms or to the bacillus typhosus.

In *nephritis* the occurrence of pleuritic effusion may be regarded as due to microbes, though the possibility of a *chemical* (toxæmic) poison cannot be well eliminated.

It is probable that in some cases of pleurisy with effusion the inflammation is by extension, as where there is primary pericarditis. Some of the pleurisies found with valvular disease are due primarily to pulmonary infarction.

Treatment.

The treatment of sero-fibrinous pleurisy must be discussed under the heads of local treatment, medicinal treatment and operative treatment.

1. Local Treatment.—This is directed mainly to the relief of pain and the lessening of the exudative process. Little can be done to lessen the amount of exudate. The application of blisters and of leeches has very little effect. In some cases of pleurisy, even if the effusion is large, severe pain is complained of, particularly at the upper border of the effusion. Hot fomentations, blisters, leeches, dry cups may give relief. At times painting the side with tincture of iodine is of benefit. The severer cases will, of course, demand the use of opium.

2. Medicinal Treatment.—By restricting the diet to the drier articles of food and by keeping the bowels freely open, particularly with a morning dose of salts, some effusions will quite rapidly disappear. The time-honored treatment by the use of diuretics and cathartics is of benefit in some cases. But harm can come if patients are purged too freely, as they are in that way weakened. It is better and more rational treatment in some cases to build up a patient by the use of tonics, cod-liver oil, hypophosphites, etc. than to cause him to lose strength by purgation in the vain hope of carrying off the effusion. In cases where the effusion is in connection with heart disease the use of cardiac tonics such as digitalis, strychnine and strophanthus

is indicated. Diuretin, or calomel used for the diuretic effect, will sometimes be found of benefit. In cases occurring in association with rheumatism the salicylates and the alkalies are to be recommended. While the list of those who advocate the use of salicylic acid in rheumatic pleurisy is very large, in practice the number of suitable cases is so small that we see but very few relieved by this method of treatment. The rare cases of syphilitic pleuritis should be treated by the proper anti-syphilitic methods. They are said to respond readily, the effusions rapidly disappearing.

3. Operative Treatment.—It is too sweeping a statement to say that every pleuritic effusion should be treatment by aspiration, but in practice nearly every pleural effusion will be benefited by aspiration. There is really no harm in performing a too early thoracentesis. Even though the chest rapidly refills, no damage has been done. There may be danger in performing the operation too late. Not a few cases of sudden death are reported where large effusions have been present in the chest; and the danger that comes from too long continued compression of the lung and from adhesions formed in an unfavorable position should not be overlooked. It may be taken as a general rule that any effusion that is three weeks old and does not show signs of lessening in amount should be aspirated. A still shorter period should be allowed in the case of children. It should not be forgotten, however, that many effusions of large extent will spontaneously disappear quite rapidly. This is particularly true in children, in the effusions following pneumonia. As urgent symptoms demanding immediate aspiration should be mentioned dyspnœa with cyanosis. Also the immediate operation should be done when the amount of fluid is large—when it is as high as to the third rib in front. Even if the operation is to be repeated, it should be done at once. It is astonishing how a small amount withdrawn will sometimes favor rapid absorption of the remainder.

It is not necessary to describe the details of the operation. This has been fully done by Matas in Vol. II. and by McCosh in this volume. It may not be out of place to repeat a few practical points:

(1) There should be strict asepsis, the field of operation being thoroughly cleansed, the instruments being boiled. This does away with the very slight danger of infecting the fluid and causing subsequent suppuration.

(2) It is much better to use a guarded needle than one with a free, sharp point. In the hands of an expert an unguarded needle may be a source of very little danger, but the possibility of wounding a lung or the diaphragm or some vessel should be reduced to a minimum.

(3) The best place to aspirate varies somewhat with the amount of fluid. In general the seventh interspace, in the mid-axillary line

or a little posterior to this, in the eighth interspace, will be found the best location.

(4) It is scarcely necessary to call attention to the necessity of avoiding puncture of the lung, the liver, the heart, the spleen, or the diaphragm. I have known of instances in which the liver, the spleen, and the diaphragm have been punctured in this operation. One should remember also that as the fluid is withdrawn the diaphragm ascends and may come in contact with the needle.

(5) If one is firmly convinced of the presence of fluid he must persist in the attempt to aspirate, even though the first one or two insertions of the needle give a dry tap. Plugging of the needle with a bit of fibrin, the encysted nature of the fluid, or some local condition not clearly recognized may explain the failure to get fluid at the first attempt.

(6) The amount of fluid withdrawn should not, in general, exceed 1500 c.cm. In fresh cases, where the lung readily expands, more may perhaps be withdrawn with safety; but in old cases, where the lung has been long compressed, where there may be adhesions, it is unwise to withdraw more than the amount specified. The writer has known of a rupture of the lung that followed the withdrawal of something over two quarts. He has seen a rapid congestion of the lung with the albuminous expectoration of the French, and a fatal result, follow the withdrawal of a quart and a half of fluid in the case of an old man with valvular heart disease, nephritis, and pleurisy.

The *dangers* from an aspiration are in reality very slight when the operation is done with ordinary care. Very rare instances of sudden death have been reported. Puncture of organs can be avoided by the exercise of care in the insertion of the needle. With proper precautions infection of the fluid should not occur; the little air that enters can be practically disregarded, as air-infection is no more a source of danger than in opening the peritoneal cavity. It should be remembered that if suppuration does occur later, it is not, of necessity, due to faulty aspiration. Many a case of pleural effusion goes on to suppuration without an aspiration having been performed. The danger also of the sudden congestion of the lung with the albuminous expectoration described by the French is not to be forgotten. Indications to stop should be the withdrawal of a thousand to fifteen hundred cubic centimetres, severe coughing spells, syncope, severe pain, or weak pulse.

The importance of a *bacteriological examination* of the fluid is self-evident. This is less important, perhaps, on the score of immediate treatment than for prognosis, for where the effusion is large or where it fails to disappear under ordinary therapy the treatment will be thoracentesis, regardless of the bacteriological finding. But as

regards prognosis and subsequent treatment the bacteriological diagnosis is of importance. This is particularly true as regards the subsequent treatment of cases found to be tuberculous. Here a change of climate and the ordinary treatment for tuberculosis will, of course, be in order. Following the evacuation of the fluid the patient should, if at all run down, be given tonics, nourishing food, fresh air. If tubercular, cod-liver oil, change of climate, and the treatment proper for tuberculosis should be prescribed. Exercise, particularly exercise tending to expand the lungs, or massage of the chest may tend to hasten the absorption of fluid that remains, or at least prevent the refilling of the chest.

DISEASES OF THE HEART.

By FREDERICK P. HENRY, M. D.

The subjects of this section are treated in the following order:

Diseases of the Pericardium: Pericarditis; Hydropericardium; Hæmo- and Pneumo-pericardium; Synechia Pericardii.

Myocarditis: Acute Diffuse Myocarditis, Sclerotic Myocarditis.

Acute Ulcerative or Malignant Endocarditis.

Simple Endocarditis.

Symptoms Common to All Forms of Valvular Disease: Dyspnœa; Digestive Disorders; Urinary Changes; Œdema; Embolism.

Treatment of Simple Endocarditis: Prophylaxis; Treatment of the Attack.

Treatment of the Results of Valvular Disease.

Schott Treatment of Chronic Heart Disease.

Medicinal Treatment of Valvular Heart Disease.

Treatment of Special Symptoms: Dyspnœa; Digestive Disorders; Œdema and Serous Effusion; Syncope; Embolism and Hæmorrhage.

Fatty Overgrowth and Infiltration.

Fatty Degeneration.

Neuroses of the Heart: Palpitation; Essential Paroxysmal Tachycardia; Bradycardia; Angina Pectoris.

Heart Disease and Pregnancy.

DISEASES OF THE PERICARDIUM.

Pericarditis.—The remarks concerning the prophylaxis of endocarditis (*q. v.*) are in all respects applicable to that of pericarditis.

In many cases of inflammation of the pericardium, such as those arising in the course of infectious diseases, pyæmia and septicæmia, Bright's disease, and scorbutus, the disease is so insidious and its symptoms so overshadowed by those of the primary affection that there are scarcely any indications for treatment. Every hospital physician of large experience has occasionally seen the pericardium covered with flakes of recent lymph in cases which, during life, had presented no cardiac symptoms whatever.

The acute form of pericarditis, of which alone there can be said to be a treatment, most frequently arises in the course of acute articular rheumatism, and may be one of its earliest manifestations. It is

of the utmost importance, therefore, that the physician in charge of a case of rheumatism should repeatedly examine the heart in order that he may obey the maxim, *Obsta principiis*, which in this disease is imperative.

When pericarditis manifests itself by a friction murmur, or when on account of pain in the region of the heart or palpitation occurring in the course of rheumatism, its presence is suspected, wet cups or leeches should be freely applied to the præcordial region. By the early employment of such measures it is believed that the course of pericarditis may possibly be cut short, and certainly favorably modified. An ice-bag should then be applied to the same region, and its use continued as long as it is grateful to the patient's sensations. Bäumler has kept up the application of ice for a week,[1] but in the opinion of the writer it is doubtful whether its effect continues beneficial after forty-eight hours. By the combined employment of local bleeding, ice, and absolute rest cardiac excitement is quieted, pain subdued, and, consequently, sleep promoted.

When the scarifications or leech-bites have healed, if signs of effusion are present a blister three or four inches square should be applied. Although this measure is disapproved of by some writers and "damned with faint praise" by others, I am convinced from clinical experience of its efficacy.

The internal treatment of pericarditis depends upon the indications presented by the individual case. If the heart is excited and tumultuous, it may be calmed by the tincture of aconite (two or three drops every two or three hours) in association with the bromide of sodium or potassium, and if pain and insomnia are present a salt of morphine, in the dose of from $\frac{1}{24}$ to $\frac{1}{12}$ grain, may be added to the mixture. On the other hand, if from the coexistence of valvular disease or other cause the heart shows signs of incompetence, digitalis or strophanthus should be given from the start. Modern opinion is opposed to the administration of calomel to the point of salivation with the object of exciting a specific effect upon the inflammatory process, but no one can deny its value as a laxative, and for this purpose it may be prescribed in small, frequently repeated doses. The iodide of potassium, either alone or with the tincture of digitalis, is a drug which may be given with advantage at all stages of the disease. In small doses—five to ten grains—it is a recognized heart tonic and analgesic, and is universally believed to promote the absorption of inflammatory products.

The further treatment of the case depends upon the presence or absence of effusion. If at the end of two or three weeks pericardial effusion is manifest, vesication should be repeated, and diuretics, such

[1] *Handbuch der speciellen Therapie innerer Krankheiten.*

as caffeine and diuretin, together with concentrated saline purgatives, should be exhibited. If the effusion still persists and dyspnœa becomes urgent, with cyanosis, distention of the veins of the neck, and a pulse rendered intermittent by inspiration (*pulsus inspiratione intermittens*), paracentesis of the pericardium in case the effusion is serous—incision and drainage if it is purulent—should be performed. For the details of these operations the reader is referred to treatises on surgery.[1]

Hydropericardium.—Serous effusion into the pericardial sac almost invariably occurs as part of a general dropsy caused by heart, lung, or kidney disease, and is of subordinate consequence. Occasionally, however, the effusion in this situation is so great as to demand paracentesis, which, under the circumstances above mentioned, can only be palliative.

Hæmopericardium and Pneumo-pericardium are symptoms of diseases, such as aneurism, cancer of the œsophagus, pyo-pneumothorax, pulmonary tuberculosis, etc., of which they precipitate the fatal termination. Their treatment is included in that of the primary disease.

Synechia pericardii (*Symphysis pericardii*), adhesion of the pericardial layers, may be attended with no symptoms whatever, or, on the other hand, may gradually give rise to the most serious circulatory disturbances, analogous in all respects to those of failing compensation from other causes. The condition may be diagnosticated by the exclusion of all other causes of venous stasis—such as emphysema, valvular disease, and fatty degeneration of the heart—and by the anamnesis—history of acute pericarditis. In addition, certain positive signs, such as systolic retraction of the præcordium and diastolic collapse of the cervical veins, should be carefully looked for.

The TREATMENT is practically identical with that of failing compensation from valvular disease, *q. v.*

MYOCARDITIS.

MYOCARDITIS occurs in two forms—the acute and chronic—of which the former may be subdivided into suppurative and diffuse.

Acute suppurative myocarditis is very rare, and is but one of the localizations of a general septicæmic or pyæmic process.

Acute diffuse myocarditis has been observed in the course of most of the infectious diseases, especially typhoid and the eruptive fevers. Since the introduction of the cold-bath treatment of typhoid fever myocarditis has greatly diminished in frequency. Many years ago—in the "seventies"—I frequently encountered cases of typhoid

[1] *Paracentesis of the Pericardium*, by Dr. John B. Roberts, Philadelphia, 1880, may be consulted with advantage.

fever presenting symptoms of which I see and hear very little at the present time. Some of these cases were fatal, death being preceded by a marked tachycardia of two or three days' duration. Others recovered after a protracted convalescence, during which the pulse-rate was habitually over 100, sometimes nearer 120. It is of course permissible to suppose, in the absence of anatomical evidence, that the symptoms of these cases were quite as likely due to nervous derangement—for example, paralysis of pneumogastric—as to myocarditis. I incline, however, to the latter diagnosis, because of the constancy of signs of myocarditis—especially cloudy swelling—in cases of infectious disease which during life had presented marked signs of "irritable weakness" of the heart; and, further, because the symptoms during the protracted convalescence of the favorable cases are just what one would expect from a disease recovery from which involves a more or less complete involution of the cardiac muscle. On the other hand, the hypothesis of nervous derangement, although much might be said in its favor, has no anatomical basis whatever.

That there is such a disease as acute myocarditis of course no one denies.[1] The only question is to recognize it where present and to treat it properly. Without entering into further diagnostic details, which would be here out of place, I would call attention to "muffling of the heart sounds" as a symptom of primary importance upon which Maclagan lays the greatest stress.

Acute diffuse myocarditis being recognized or suspected, the patient should be kept at absolute rest, and if the heart is excited, and especially if fever is present, an ice-bag may be applied tentatively to the chest. If its effect is beneficial and the sensation of cold grateful to the patient, it may be continued for one or more days. In the same way—*i. e.* tentatively—alcoholic stimulants in moderate dose may be exhibited. Their effect is sometimes decidedly calming and at the same time strengthening. Individual idiosyncrasies with reference to alcohol are, however, so great that nothing positive can be predicated concerning its use. Digitalis, sparteine, caffeine, the bromides, valerian, ether, and strychnine, all find their applications in individual cases. During convalescence a nourishing, non-stimulating diet, into which milk enters largely, combined with general and local massage[2] and the internal use of iodide of potassium in small doses, strychnine, and iron, are the therapeutic measures from which good results may be confidently expected.

Chronic interstitial or sclerotic myocarditis is generally overlooked, or, at the most, its existence is merely suspected. It arises secondarily to sclerotic vascular changes, and may form the basis of a

[1] For a typical example of the disease, with account of autopsy, see *Maclagan on Rheumatism*, ed. 1881, p. 169.

[2] Vide *Massage des Herzens*, by Oertel.

cardiac aneurism. The only cases which afford any prospect of benefit from internal medication are those of syphilitic origin, in which mercurials and iodides, especially the latter, should be perseveringly employed. The symptoms to which it gives rise are very vague, and, when most pronounced, consist of dyspnœa and cardiac oppression or pain on slight exertion, and arrhythmia. It is an occasional cause of sudden death in individuals of sedentary life who are suddenly called upon to make some exertion which, to a sound individual, would be considered trivial.

ENDOCARDITIS.

Acute Ulcerative ("Malignant" Endocarditis).

The treatment of this disease, which is regarded as inevitably fatal, must of necessity be limited to prophylaxis and palliation. With reference to the former a brief mention of the causes of the affection is appropriate.

Ulcerative endocarditis is an inflammation of the endocardium produced by the agency of micro-organisms. Its inflammatory products are distinguished by their tendency to necrosis and disintegration, which renders them liable to be swept along the blood-current and give rise to multiple foci of inflammation in various tissues and organs. It was first described by Virchow in association with puerperal fever, and believed by him to be due to microbes. The latter may gain entrance through wounds apparently trivial, such as those caused by paring a corn, opening a furuncle, frost-bites, etc. It is most frequently observed as a complication of infectious diseases, such as puerperal fever, the infectious exanthemata, pneumonia, diphtheria, diseases of the bones, and acute articular rheumatism. It is most frequently associated with pneumonia: in about 25 per cent. of the recorded cases this association was observed.

Suppurative processes in any part of the body may cause it. Thus it has been seen in cases of empyema, pyelonephritis, suppurative inflammation of pelvic organs, inflammation of the gall-bladder, etc. It is called "spontaneous" when neither wound nor inflammatory focus can be detected, but such a thing as spontaneous or idiopathic ulcerative endocarditis is, with our present knowledge of infectious processes, scarcely conceivable.

Among the multiplicity of symptoms to which this disease gives rise, three types may be recognized: (1) a typhoid type; (2) an intermittent type; (3) cases of which the chief symptoms are referable to some particular organ. The two first named are, for present

purposes, sufficiently described by their names. In the third variety signs of serous inflammation (of joints, pleura, or peritoneum) may predominate and divert attention from the true seat of disease, or the disorder may assume the clinical picture of cerebro-spinal meningitis, with high fever, delirium, rigidity of cervical muscles, retraction of head, and automatic movements.

Hemiplegia may be the first symptom to excite alarm, being caused by embolic plugging of a large cerebral vessel; or a single cranial nerve, such as the facial, may be paralyzed, the cause in this instance being an embolism of "miliary" dimensions.

Psychical disturbances may predominate and simulate acute mania; in fact, there is a recorded instance of a case of ulcerative endocarditis being sent to an insane asylum.

From this brief description of the multifarious symptoms of ulcerative endocarditis it is manifest not only that it affords abundant scope for the palliative resources of the practitioner, but that it is impossible to formulate a plan of treatment that is applicable to all cases.

The general treatment of this disease is, practically, that of septicæmia. The strength is to be maintained with nutritious food and alcoholic stimulants, of which there is often a remarkable tolerance; pain and restlessness subdued by opium and its derivatives; insomnia combated with paraldehyde, sulphonal, trional, and the bromides; and the heart's action maintained by digitalis, strychnine, caffeine, and sparteine. Quinine, salicylic acid, and benzoate of sodium (1 gramme every hour) have been given with a view to destroy the microbic agents of the disease, but, it must be acknowledged, in vain.

Rare cases of supposed recovery from this disease are recorded, of which the most authentic is reported by Eichhorst, the diagnosis being based upon signs of embolism of skin (petechial spots) and kidneys and painful swelling of joints, coinciding with the physical signs of valvular heart disease. The attack occurred after parturition, and recovery ensued after a tedious illness of several months' duration, signs of mitral insufficiency remaining. In this case, which was of the typhoid type, the patient having been sent to hospital with the erroneous diagnosis of typhoid fever, the medicinal treatment consisted chiefly of a pill of hydrochlorate of quinine and corrosive sublimate:

℞. Quininæ hydrochlor., gr. lxxv (5.0);
Hydrarg. chlor. corrosiv., gr. ij (0.2);
Pulv. althææ, q. s. ut ft. pil. No. xx.
Sig. One pill thrice daily, after food.

Simple Endocarditis.

The valvular lesions consecutive to endocarditis are practically incurable, if by cure we mean the disappearance not only of the

symptoms, but also of the signs of heart disease. Exceptional cases have been reported by Leyden and Eichhorst in which these conditions of cure have been fulfilled, and, coming from such sources, they must be regarded as authentic. One can readily understand how, as in one of Eichhorst's cases, an aortic insufficiency dependent upon the retraction of two aortic cusps may be repaired by the stretching of the third, and also how a mitral insufficiency may, by contraction, become converted into a stenosis. In the latter case, however, the remedy, if such it can be called, is no better than the disease, and in neither is the process under control. The question of the disappearance of a valvular murmur is always a delicate one, its presence or absence depending largely upon the existing degree of blood-pressure. It is a matter of common observation that the intensity of a murmur may vary within wide limits, so that most instances of reported cure will always be open to criticism.

The repair of valvular lesions being practically out of the question, our therapeutic efforts must, of necessity, be limited to their prevention and to the alleviation of the symptoms to which they give rise. It is indispensable, therefore, that we consider, first, the causes of these affections; and, secondly, their consequences, and in so doing disputed and unsettled questions of bacteriology will be strictly ignored.

Excluding congenital anomalies, the immediate cause of every valvular lesion is endocarditis, which may be acute, subacute, or chronic. With the acutest form of this disease, the malignant or ulcerative endocarditis, we are not at present concerned. It undoubtedly causes extensive valvular defect, but the general symptoms of infection to which it gives rise, or is secondary, are so preponderant and so grave that the cardiac disease is of secondary consideration. Besides, as indicated by the term "malignant," this form of endocarditis is almost inevitably fatal, and its course is, as a rule, so rapid that the usual symptoms of cardiac incompetence have not time to develop.

By far the most frequent cause of the simple or non-malignant form of endocarditis is acute articular rheumatism. It is the tendency of rheumatism to affect the fibrous structures of the heart, which makes it one of the most serious diseases that the physician is called upon to treat, and gives to his prognosis of ultimate restoration to health a large degree of uncertainty. The frequency with which rheumatism is complicated with endocarditis is variously estimated. By Bamberger endocarditis is said to occur in 20 per cent. of the cases of rheumatism; by others it has been stated that from 50 to 60 per cent. of all cases of rheumatism are accompanied or followed by endocarditis or pericarditis, or both. It is evident that the "personal

equation" is concerned in the formation of such widely varying opinions. The more acute the attack of rheumatism the greater is the liability to cardiac complications. These are also more common in the young than the middle-aged. Endocarditis is the most frequent cardiac complication of rheumatism, and is almost invariably left-sided. The reason of this preference is that the valves of the left side are subject to much greater strain than those of the right. It is a curious fact that while acute rheumatic inflammation gives rise to great pain on the slightest movement of the affected joint, the same process in the valves of the heart, which are in continual movement, is often attended with no pain whatever. Another and most unfortunate difference between these structures is that, whereas the joint-inflammation is, as a rule, completely recovered from, that of the valves of the heart rarely, if ever, can be. It has been stated in explanation of the latter fact that the products of the joint-inflammation are absorbed on account of the counter-pressure exercised upon them by the surrounding solid structures, whereas, in the valves which are freely movable in the heart, the products persist on account of the absence of this salutary counter-pressure. A much simpler and more correct explanation is that which attributes the recovery of the joints to the rest which is enforced upon them by acute pain, whereas the heart not only gets no rest, but, owing to the febrile condition of the system and the irritation of its tissues, is actually compelled to do an unusual amount of work.

Next in frequency to rheumatism as a cause of endocarditis comes scarlatina, which is said to give rise to valvular disease either directly, or indirectly through the medium of arthritis, in 10 per cent. of the cases. Other infectious diseases which are occasionally followed by endocarditis are variola, erysipelas, measles, and gonorrhœa. The latter, like scarlatina, may be immediately followed by inflammation of the fibrous structures of the heart, or an articular inflammation may intervene.

The above are the universally recognized causes of endocarditis in general, but there are certain special valvular defects in the etiology of which other factors are undoubtedly operative. In the causation of mitral stenosis, for example, the influence of sex has attracted the attention of all observers. About 70 per cent. of the cases of mitral stenosis occur in females. This fact has as yet received no satisfactory explanation. Rheumatism is more common in girls than in boys, but this would explain a preponderance of all kinds of valvular disease in women, and not of this particular condition. Anæmia is a recognized cause of valvular disease, and anæmia is certainly more prevalent in females than in males. Anæmia also causes slowly progressive rather than acute forms of valvular disease, and it is the

slowly progressive forms of inflammation that lead to mitral stenosis. The more frequent combination of rheumatism and anæmia among women is probably the cause of the preponderance of mitral stenosis in the female sex. It is true that we often encounter cases of mitral stenosis in which no history of articular rheumatism can be elicited, but it should be borne in mind that there are other manifestations of rheumatism than inflammation of the joints. For example, there can be little doubt that many cases of tonsillitis are rheumatic, as is evidenced not only by their yielding to the remedies which are most efficacious in the treatment of rheumatism, but also by their being occasionally followed by endocarditis. Erythema nodosum is another affection which is generally believed to be a manifestation of the rheumatic diathesis, and there is good reason for believing, with Abraham Jacobi, that the so-called growing pains of adolescents are often of rheumatic origin. We should not, therefore, in cases of valvular disease assume the previous absence of rheumatism merely because the patient has never suffered from acute arthritis. At the same time, it must be admitted that in the etiology of a certain number of cases of mitral stenosis the influence of rheumatism is either traced with difficulty or is absent.

The same is true of disease of the aortic valves, in the causation of which atheroma—which, in its turn, may depend upon syphilis, alcoholism, gout, over-exertion, or senility—is a frequent factor. In this connection I may call attention to the tradition that valvular heart disease and pulmonary phthisis are mutually exclusive, and, so far as the mitral valve is concerned, I believe it to be well founded. A lung flushed with oxygenated blood, as in cases of mitral disease, does not afford a favorable soil for the tubercle bacillus. In my experience the valvular affections associated with pulmonary phthisis have been almost invariably aortic. In such cases the valvular disease is usually atheromatous, and is secondary to similar degeneration of the aorta. As is well known, there is, to say the least, no antagonism between atheroma and phthisis.

Symptoms Common to All Forms of Valvular Disease.—Every form of valvular disease tends to produce an accumulation of blood on the venous side of the circulation: in a word, venous congestion. This may be prevented for an indefinite period by what is technically known as "compensation." A valvular disease is said to be compensated when there are neither symptoms nor signs of venous congestion. Compensation is effected by hypertrophy of one or both ventricles. In aortic disease, whether this be in the nature of stenosis or insufficiency, the hypertrophy by which compensation is made for the valvular defect affects chiefly the left ventricle, whereas in mitral disease of either kind the hypertrophy affects chiefly the right ven-

tricle. Compensation may be disturbed in various ways. It is self-evident that a heart which is capable of maintaining the circulation when the patient is leading a regular, tranquil existence may be absolutely incompetent under circumstances demanding greater activity of body or mind. The most frequent cause of disturbed compensation is over-exertion, such as running, climbing long flights of stairs, lifting heavy weights, dancing, swimming, rowing, and the like. Mental disturbances, such as those dependent upon fright, grief, and anxiety, are almost equally efficacious in destroying the vascular equilibrium. The abuse of tea, coffee, tobacco, and alcohol, or, in many cases, the mere use of these substances, tends, although more imperceptibly, to the same result. There are certain states, both physiological and pathological, in which the demands upon the circulation are often such as to severely tax the activity of a healthy heart. The chief of these are the infectious fevers, pulmonary diseases, pregnancy, and parturition. As a matter of course, a heart which is employing most of its reserve force in maintaining the circulation is speedily rendered incompetent by any of the complications above mentioned.

Dyspnœa.—The earliest symptom of cardiac disease is dyspnœa. This may not be apparent, either subjectively or objectively, when the patient is quiescent, but is induced by an amount of exercise so slight as scarcely to accelerate either pulse or respiration in a healthy individual. The dyspnœa is often combined with bronchitis, both being dependent upon pulmonary congestion. Under such circumstances the patient generally attributes his dyspnœa to bronchial catarrh, and the physician who is not systematic in his clinical examination may be misled into this supposition. The dyspnœa, although habitual, may be aggravated in paroxysms to which the name *cardiac asthma* is often loosely applied. There is nothing incompatible between valvular heart disease and spasmodic asthma, but, unless attacks of dyspnœa are attended with sibilant and sonorous râles, inspiratory position of the thorax, and prolonged expiration, they cannot justly be called asthmatic. Most of the so-called attacks of "cardiac asthma" are associated with and caused by palpitation of the heart, which, in its turn, is due to some unusual physical exertion or mental excitement, to gastro-intestinal disorder, or to the recumbent position. It is doubtless partly owing to the latter cause that the attacks are often nocturnal, the patient being suddenly roused from sleep by a sense of impending suffocation.

As the heart grows more and more incompetent the dyspnœa becomes constant, until at last, for days or even weeks preceding death, the patient is unable to lie down, but passes his nights seated in one chair, with his arms resting on the back of another. That

peculiar form of respiration to which the names of Cheyne and Stokes have been applied (the so-called Cheyne-Stokes respiration) is often seen in the last stages of valvular disease of the heart. On close inspection it will be observed that there are times when the respiratory movements come to a complete standstill, and that these periods of cessation occur at regular intervals. For half a minute or more no signs of respiration can be detected, and, strange to say, while this vital function is held in abeyance, the patient may exhibit no signs of distress whatever. Suddenly respiration is resumed with a slight gasp, and at first seems to proceed in a regular manner. Very soon however, the respirations may be observed to increase in depth and frequency on a regularly ascending scale, until the maximum in these respects is reached. They then become gradually slower and shallower, until again they cease entirely. This phenomenon may be observed for many days before death. It is not peculiar to cardiac disease, but is also seen in affections of the brain and kidneys. It is supposed to be due to variations in the excitability of the respiratory centre from rhythmical alterations in its supply of blood.

Digestive Disorders.—In health, the sense of repletion which follows the ingestion of food is partly due to congestion of the vessels of the gastric mucosa, and therefore in heart disease, in which there is more or less stasis of the portal blood-vessels, anorexia is the rule. The congestion of the portal system is more marked in mitral than in aortic lesions, and consequently it is in the former that the symptoms of "cardiac dyspepsia" are most pronounced. Post-mortem evidences of catarrh of the gastric mucosa are commonly found. The lining membrane of the stomach is covered with a layer of tenacious mucus, which being removed shows the underlying tissue to be congested, infiltrated with serum, suffused with extravasated blood, and sometimes riddled with a multitude of minute erosions. It is evident that such a state of the stomach must be highly unfavorable to nutrition, and it is probable that it is largely responsible for the anæmia which is so common an attendant of valvular heart disease, and which was designated many years ago by Andral by the title *cachexie cardiaque*.

The portal congestion is further manifested by enlargement of the liver and by a sense of weight and tension in the right hypochondrium, or even by tenderness or pressure in this region. The spleen is much more seldom demonstrably enlarged. Icterus is by no means rare in advanced stages of valvular disease, and may be due to hepatic congestion or gastro-duodenal catarrh, or to a combination of both of these causes. Hæmorrhoids, leucorrhœa, menorrhagia, and retinal hæmorrhages have all been observed in the course of cardiac valvular disease, and are to be ascribed to the obstruction of the return of venous blood.

Urinary Changes.—The urinary secretion presents certain characteristic alterations which are significant of renal congestion, no matter how produced. In heart disease with deficient compensation, in emphysema, and in asthma—in short, wherever there is chronic obstruction to the return of venous blood to the heart—the renal secretion displays, in greater or less degree, the following characters: In the first place, it is diminished in quantity. Secondly, and as an almost necessary consequence, its color is deeper, and it deposits, on standing, a more or less copious precipitate of uric acid and urates. This does not indicate an increase in the total diurnal amount of these substances; on the contrary, they are diminished, but not in the same proportion as the water—they are relatively in excess. The total diurnal amount of urea is also less than normal, although also relatively increased. In other words, in an ounce of the "urine of congestion" there may be more uric acid, more urates, and more urea than in the same amount of normal urine, but the total number of ounces of the former is so much less than normal that the amount of solids which it carries out in solution is greatly reduced. According to Senator, the diminished amount of urea may be partly due to the fact that this substance passes into the dropsical effusions and is also excreted, in the diseases above mentioned, by the intestines.

It is often stated and accepted without question that the urine of congestion contains blood and an abundance of albumin, but such statements, which are the result of deductions from experiments on animals, are far from being confirmed by clinical facts. So long as the condition of the kidney is that of mere congestion the albuminuria is slight. As to hæmaturia, it is scarcely ever present in macroscopic amount, and it is only in a minority of cases that red blood-corpuscles can be detected with the microscope. The scanty blood-corpuscles occasionally found are probably derived from the hyperæmic mucous membrane of the renal pelvis and not from the renal parenchyma. Hyaline casts may also be present. In course of time the congestion may give rise to nephritis, in which event the albuminuria will be decidedly increased. The peculiarities of the urine of congestion are due to diminished arterial pressure. This is proved by the fact that when the heart's action is strengthened by digitalis or other cardiac tonic, the abnormal characters of the urine often entirely disappear. The secretion becomes increased in quantity, often enormously so, the albuminuria disappears, and the urates, the uric acid, and the urea become relatively diminished and absolutely increased.

Œdema.—Sooner or later, in most cases of heart disease œdema sets in. It is largely mechanical, as is proved by the fact that it first appears in the most dependent portions of the body; but not

entirely so, since it undoubtedly occurs earlier in the anæmic than in those who are comparatively well nourished. It is first observed in the evening, especially in those who are obliged to stand while at work, and disappears entirely during the night. It gradually appears earlier in the course of the day and at last a stage arrives when it is constantly present. If life is sufficiently prolonged, the œdematous infiltration creeps slowly upward until the thighs, the genital organs, the trunk, upper extremities, and face are involved. The ultimate result of the obstruction to the circulation is effusion into the serous cavities, these being usually involved in the following order: peritoneum, pleura, pericardium, ventricles of the brain, and subdural space. The existing dyspnœa is greatly increased by effusion into the two first-named cavities, the result being, in the one case, interference with the descent of the diaphragm, and, in the other, compression of the lung. The effect of gravity upon the disposition of the œdematous fluid is well seen in patients who lie habitually upon one side. On the dependent side of the trunk the tissues are swollen and pit deeply upon pressure, while in the corresponding tissues of the opposite side pitting is slight or absent.

In extreme degrees of œdema the skin of the lower extremities is sometimes raised into vesicles or blebs which rupture and become the sites of a constant oozing of fluid. I have also seen this occur in the upper extremity. Erysipelatous inflammation and even gangrene may have its starting-point in the ruptured portions of integument.

Embolism is an accident liable to occur in all cases of valvular heart disease, and may have its seat in the pulmonary circulation or in that of the general arterial system. In the former case it gives rise to the symptoms and signs of hæmorrhagic infarction of the lungs (*apoplexia pulmonum*), the chief of which are sudden pain in the chest, dyspnœa, and hæmoptysis. The auscultatory phenomena, which are only present when the infarct is of considerable size and superficially seated, are identical with those of pneumonic consolidation in general.

In the extremities the onset of embolism is indicated by sudden pain and a sense of weakness in the affected limb, sometimes also by numbness or paræsthesia. Below the obstruction the vessel is pulseless until the collateral circulation is established. Of the lower extremities the left is more often the seat of embolism, because the left iliac artery is more nearly parallel with the aorta than the right. If the circulation is suddenly cut off from both lower extremities the accident is probably due to embolic obstruction of the aorta, although instances are recorded in which both iliacs have been simultaneously occluded.

The spleen and kidney are the favorite seats of embolism. In the former the accident may be signalled by sudden pain and tenderness

in the left side, accompanied with rise of temperature, vomiting, and splenic enlargement; while in the kidney it is manifested by lumbar pain and by hæmaturia.

Embolic occlusion of the superior mesenteric artery gives rise to sudden abdominal pain and signs of collapse, followed by the passage of blood-tinged stools. The superior mesenteric artery being a "terminal" vessel, its obstruction is followed by extensive hæmorrhagic infarction of the intestinal mucosa.

The most serious consequences result from embolism of the cerebral vessels, of which the one most frequently occluded is the left Sylvian artery. The greater frequency of left-sided embolism of the brain is due to the fact that the innominate artery springs from the aortic arch at almost a right angle while the course of the left carotid is nearly in line with the blood-current.

Apart from gross alterations of cerebral structure, such as those produced by embolism, patients with heart disease often exhibit symptoms directly referable to the brain. They become moody, irritable, or melancholic, and may even have transient attacks of delirium or mania. The functional disturbances are undoubtedly dependent upon the disordered state of the cerebral circulation. The statement has been made that melancholia is apt to be associated with affections of the mitral valve, while those of the aorta are more prone to be attended with symptoms of irritation.

Treatment of Simple Endocarditis.—In discussing the treatment of valvular diseases we have first to decide whether there is any means of preventing the endocarditis upon which they depend. Next in order comes the therapeutics of the endocarditis itself, and, finally, that of the circulatory disorders, and their results, to which the valvular imperfections give rise.

1. *Prophylaxis of Endocarditis.*—Of the various diseases which give rise to endocarditis there is but one—acute articular rheumatism—for which there is a specific treatment; so that the question whether we can prevent an inflammation of the endocardium is practically identical with that of our ability to prevent the involvement of a particular joint. In many cases of rheumatism endocarditis is present and recognized by the physician at his first examination of the patient; in others it is present, but not sufficiently advanced to make its presence known by signs; and I believe also that there are good grounds for the opinion that rheumatic inflammation may attack the heart primarily, constituting the *endocardite rhumatismale d'emblée* of French writers. In cases such as these the time for prophylaxis has gone by, but this fact is only patent when the endocarditis is recognized. When it is latent, *i. e.* not sufficiently advanced to interfere with valvular function, and manifests itself at a comparatively late

period, the conclusion seems to be warranted that the specific antirheumatic treatment has been useless, so far as the prevention of endocarditis is concerned. Nevertheless, this conclusion, under such circumstances—and I believe them to be frequent—is manifestly false. I am not of those who hold that the benefits of the treatment of rheumatism with the salicyl compounds are limited to the relief of pain. The *argumentum ad hominem* is, in this instance, unanswerable, for no one who has suffered from an attack of acute articular rheumatism and *has treated it promptly* can fail to perceive the curative power of salicylic acid and its salts. There appears to be a law that the curative power of a specific method of treatment is in direct ratio to its early employment. We see this conspicuously in typhoid fever and diphtheria, and also, I believe, in rheumatism.

While, therefore, from the nature of things, there can be no proof in any given case of rheumatism that endocarditis has been prevented by treatment with the salicyl compounds, there is no doubt that such treatment is the only one to be relied on. There are those who are much more positive as to the prophylactic power of the salicyl treatment. For example, Professor Latham of Cambridge, England, states, as the result of such treatment, that in no case of rheumatism under his care during the course of six years was there developed, "when the heart was previously sound, any cardiac complication, such as endocarditis or pericarditis."

My own opinion of this question of prophylaxis is practically identical with that of Professor Whitla of Belfast, and I cannot express it more clearly than in the words of this well-known author: "Conflicting opinions prevail about the value of salicin or salicylates in preventing endocarditis. The writer has carefully watched the results of this treatment at the bedside, and has, as far as possible, kept an eye upon the patients afterward. His experience, though it does not lead him to believe that the salicylic acid treatment more than appreciably lessens the chance of endocarditis, nevertheless leads him to believe that it will be proved that a large proportion of the salicylic cases escape the more serious forms of valvular lesion."[1]

Absolute rest in bed, uniform temperature of the patient's apartment, and regular action of the bowels, are coincident measures of prophylaxis which should never be neglected.

Medical Treatment of Simple Endocarditis.—Supposing the presence of endocarditis to be recognized, the question at once arises whether we possess any means by which its course may be favorably modified, and it must be confessed that its solution is quite as difficult as that of the question of prophylaxis. Nevertheless we must act, and promptly, making use of such measures, both local and general, as

[1] *Dictionary of Treatment*, 1892, Lea Brothers & Co.

experience has seemed to prove of value. If quietude on the part of the patient has been previously relative, it must now be made absolute, and if the patient is not fully under the influence of salicylic acid, this drug or one of its salts should be continued in full doses until ringing in the ears and slight giddiness are produced. In addition, the bicarbonate of sodium or potassium or the citrate of the latter should be administered in doses of 20 grains every three or four hours. An effective and palatable method of giving the latter is an effervescing draught made by mixing a solution of potassium bicarbonate with lemon-juice. If the heart is excited in its action aconite will be found of service, and may be given with the bromide of potassium, as in the following prescription:

℞. Tincturæ aconiti, ♏xxiv (1.6);
Potassii bromidi, ʒij (8.0);
Aquæ camph., ad f℥iij (90.0).—M.
Sig. Two teaspoonfuls every two hours.

At the same time, at least one free evacuation of the bowels should be secured daily by the use of salines, such as magnesium sulphate, Rochelle salt, or Carlsbad salts. To children who object to such bulky and unpalatable doses, calomel may be administered. Stimulants are rarely needed, although when the patient is debilitated and anæmic both whiskey and ammonia may be employed with decided benefit.

Locally, cold and heat, rubefacients, vesicants, leeches, and belladonna are advocated. Although it cannot be demonstrated that the course of an endocarditis is modified by vesication of the præcordial region, the faith in blisters is still held fast by many well-known authorities.

The line of local treatment that I would recommend in cases of non-malignant endocarditis is the following: As soon as it is suspected that the endocardium is involved, cold in the form of an ice-bag should be applied to the præcordium. At the end of twenty-four hours this should be followed by a blister three or four inches square if there is much præcordial distress, anxiety, and palpitation; or, if the patient is vigorous, a dozen leeches may be applied. On the other hand, if the cold application has had the effect of allaying cardiac excitement, it may be replaced by a belladonna plaster. The latter possesses one marked advantage over the blister in that it does not interfere with the renewed application of the ice-bag, which may be laid directly upon it.

Both calomel and iodide of potassium are drugs to which tradition, presumably based upon experience, assigns the power of promoting

absorption of inflammatory exudates. The former may be given from the commencement of the attack, and if it has no other effect than keeping the bowels active it will not be employed in vain. When the temperature has become normal and the heart has lost its irritability—in other words, when the inflammation has apparently run its course—iodide of potassium may be prescribed, beginning with 5 grains three or four times daily and gradually increasing the dose until 30 or 40 grains are taken *per diem*. This drug should be continued, with occasional intermissions, for two or three months. It may be conveniently administered in saturated solution (one drop containing one grain) mixed with milk, the unpleasant taste of the drug being most effectually disguised by this fluid.

Treatment of the Results of Valvular Disease.—Although it cannot be too strongly emphasized that each case of valvular heart disease should be treated individually—*i. e.* with special reference to the indications it presents—there are certain general hygienic regulations that are applicable to all cases. The chief of these have reference to diet, clothing, occupation, dwelling, the use of tobacco, marriage, bathing, etc.

Diet.—In describing the symptoms common to cardiac valvular disease the marked tendency to digestive disorders was pointed out. The food should therefore be of the most digestible character and the amount consumed at any single meal should be restricted. It is decidedly better to add to the number of the daily repasts than to overload the stomach at any one of them. The uncomfortable sense of repletion, the cardiac oppression, and sometimes the palpitation experienced by healthy people after a surfeit are significant indications of the dangers attendant upon similar indiscretions by those affected with heart disease. A diet largely composed of carbohydrates is, in my experience, the one best suited to the cases under consideration, and especially is this the case during the stage of hypersystole.

Tender meats, boiled, broiled, or roasted, light puddings, such as may be made of rice, bread, tapioca, and Irish moss; fruits, either fresh or stewed, and all kinds of succulent vegetables are admissible; while rich soups, pastry, fried meats, and fat should be eschewed. Butcher's meat should not be a constituent of more than two of the daily meals, and as a rule the patient will thrive best when it is consumed but once daily, its place being amply supplied at the other repasts by eggs, fish, excluding salmon, and milk. At times, when signs of indigestion appear, the diet may for a few days be advantageously restricted to milk with the addition of bread or other farinaceous substance. It is well established that the digestion of milk is accomplished with a minimum degree of labor on the part of the digestive organs, and after the comparative rest which they enjoy on

a milk diet their functions are performed with greater efficiency. It has been estimated that at least three litres of milk are necessary to maintain the nutritive equilibrium of an adult at rest, as is evident from the following tables:

1. *Amount of nutriment required by an adult at rest:*

Water,	2635 grammes;
Albumin,	137 "
Fat,	117 "
Carbohydrates,	352 "

2. *Constituents of 3 litres of milk:*

Water,	2593 grammes;
Albumin and casein,	108.80 "
Butter,	121.50 "
Sugar,	165 "

Since few stomachs can tolerate the daily ingestion of three litres of milk, it will be found best, as a rule, to restrict the amount of this substance to two litres and supplement the deficiencies with bread and butter. There are certain individuals who cannot or will not tolerate milk either in the crude state or peptonized or boiled, and of such it can only be said that they are placed at a disadvantage for which there is no compensation.

Of late years a most commendable industry has been displayed by the manufacturers of alimentary substances; so much so, in fact, as to have excited hopes in the minds of visionaries that the definition of man as a cooking animal will ere long cease to be appropriate. Certain of these food-products are of undoubted value in cases of heart disease, and may be administered either as complementary to a partial milk diet or as additions to a restricted solid dietary. Those which I have in mind belong chiefly to the proteid group, and are either fully or partially predigested. I refrain from specific mention of any of these substances for reasons that are, doubtless, well understood, leaving to the intelligent practitioner the duty of determining their value in individual cases.

Clothing.—The clothing should be warm, light, and loose. That next the skin should be of wool throughout the year. Many patients, especially women, will object to such a requirement, as they will to the equally important advice to discard the thorax-constricting corset. The demands of fashion are, in their case, more imperative than those of hygiene, and, since the physician cannot compel obedience, he is often obliged to make concessions which are unnecessary in the case of men. It is above all things important that the feet should be kept

warm and dry. I have seen the most marked cardiac incompetence, with universal anasarca, suddenly arise after prolonged immersion of the feet in cold water, the patient having previously exhibited no signs of cardiac failure. There is, in all cases of valvular disease, and more especially in the mitral lesions, a congested condition of the bronchial mucous membrane which may be regarded as the point of least resistance. An aggravation of this congestion by the supervention of bronchial catarrh is often sufficient to convert a condition of comparative well-being—"eusystole"—into one of pronounced "hyposystole." Every means, therefore, should be adopted to avoid "catching cold," and, of them, those which relate to the clothing are the most important. The practice of wearing light slippers in-doors is a fruitful source of colds and should be condemned. In the best-ventilated houses it is impossible to maintain the temperature of a room at a uniform level, and therefore the feet are constantly surrounded with a comparatively cold stratum of air. The inference is that it is more important to secure warmth of the feet while in-doors and at rest than while out of doors and walking.

Occupation and Exercise.—Occupations which involve either intermittent or long-continued muscular exercise, as well as those which, although sedentary, require a cramped position of the body, and so interfere with respiration, are inadvisable. Under the latter head come the trades of tailoring and shoemaking. It is an excellent rule to warn the patient against the pursuit of such occupations as, in the healthy, tend to develop the muscular system. The type of such trades is that of the blacksmith, and practically on the same plane is the work of the sailor, the carpenter, and the boiler-maker. In my experience, a large proportion of cases of heart disease, especially of the aortic valves, have come to hospital from machine shops in which the patient, while engaged in severe manual work, has been exposed to sudden and great changes of temperature.

It is useless to prescribe a serene frame of mind to individuals of excitable temperament, but they should be advised to desist from pursuits which tax the emotions severely. Outbreaks of temper and violent emotions generally act in the same way as severe bodily exertion. In this connection the most interesting case on record to medical men is that of John Hunter, who had long suffered from angina pectoris and died from the immediate effects of violent excitement. The scene of his death was the board-room at St. George's Hospital. "In the course of his remarks he made some observation which one of his colleagues thought it necessary instantly and flatly to contradict. Hunter immediately ceased speaking, retired from the table, and, struggling to suppress the tumult of his passion, hurried into the adjoining room, which he had scarcely reached when, with a deep

groan, he fell lifeless into the arms of Dr. Robertson, one of the physicians of the hospital who chanced to be present."[1]

Hunter, from all accounts, was a man of ungovernable temper and quite conscious of his infirmity, for before the meeting referred to he had "expressed his apprehension lest some unpleasant dispute might occur, and his conviction that, if it did, it would certainly prove fatal to him."

In all such counsel as relates to the occupation, the circumstances of the patient are first to be considered. Advice which, to the affluent, is easily followed and perhaps coincides with his inclinations, is impossible and absurd to him whose daily bread is obtained by the keenest competition. Who can deny that the latter has chosen the better part when he decides to die at his post? Certainly not the physician whose example is so often in direct contrast to the precepts which he endeavors to inculcate.

As long as there is perfect compensation for a valvular defect the patient is conscious of no cardiac imperfection. It is a great mistake, however, to encourage such a person to compete, whether in the way of business or amusement, with individuals in perfect condition—*i. e.* if such attempts are attended with physical exertion.

The inevitable medical tendency to pass from one extreme to another is nowhere more marked than in the treatment of heart disease. It is not long since the belief was prevalent that valvular heart disease doomed the patient to speedy death, in spite of the fact that the individual in whose case the diagnosis was made, perhaps by mere accident, was conscious of no cardiac trouble. Such opinions were definitely refuted by Sir Andrew Clark, who reported 684 cases of valvular disease which had been in existence for at least five years without leading to any serious impairment of health. A complete reaction from the old pessimistic views at once set in, and instead of immuring such patients in their homes and condemning them to a life of inactivity, they are now often encouraged to exert themselves to the utmost of their limited capacities. In my opinion, the present tendency is rather to encourage patients with heart disease to overexertion. They are not sound, vigorous individuals, and although they should, as far as possible, refrain from brooding over their ailment, they should also never completely forget its existence. The only exercise in which they should indulge to any great extent is walking. Any exertion which involves much use of the arms, such as rowing, is injurious, and tennis, base-ball, cricket, bicycling and swimming are suicidal. Probably the most injurious combination of sports is swimming in cold water.

The Oertel method, which combines a special dietary with massage,

[1] *Hunterian Oration for 1855,* by Joseph Ridge, M. D.

vapor- and hot-air baths, and carefully graduated exercise in the open air, will be described in detail when discussing the treatment of fatty infiltration of the heart. It is undoubtedly advantageous in certain cases of well-compensated valvular disease in which there is a decided tendency to obesity, but is contraindicated by extensive arterio-sclerosis, angina pectoris, and failing compensation—in a word, by hyposystole.

The use of tobacco should be absolutely interdicted. No healthy person addicted to the use of tobacco who is self-observant can have failed to notice that it excites the action of the heart, whether by stimulating one set of nerves or depressing another it is not our province to inquire. The effect of the weed is necessarily more powerful upon a heart already weakened by disease. As a rule, the patient experiences no great difficulty in weaning himself from tobacco. In fact, he often does so voluntarily, finding that its fumes, which were formerly so agreeable, have either lost their soothing power or become positively distasteful.

Tea and coffee in moderation—one cup of either twice daily—may be permitted, the caffeine which they contain being generally acknowledged to be one of the most valuable drugs employed in the treatment of heart disease.

Schott Treatment of Chronic Heart Disease.—The method of Dr. Schott, as pursued by him at Nauheim, has of late received considerable attention, although it has been in successful operation for many years.

The method is a twofold one, consisting chiefly in the use of saline baths highly charged with carbonic acid gas, and of carefully graduated, gentle exercises. The springs of Nauheim contain an extraordinary amount of carbonic acid gas (1.340 c.cm. to the litre) and are remarkably rich in mineral constituents, of which the chief are chloride of sodium, chloride of calcium, and carbonate of iron. The first-mentioned salt is in solution to the amount of from 2 to 3 per cent.; the two latter, to the amount of from 2 to 3 per mille. In the opinion of thoroughly competent and trustworthy men who have investigated Schott's method, these baths exert a remarkable effect upon the circulation and consequently upon the heart.[1] On immersion, the bather experiences a sensation of tingling and warmth which is due to the contact of the particles of carbonic acid gas with the integument. The pulse becomes slower and increases in volume and strength, while the area of cardiac dulness, in cases of dilatation, perceptibly diminishes and the apex-beat approaches more closely to the normal position. The liver also, when engorged in consequence of incompetence of the right ventricle, becomes demonstrably smaller.

[1] *Cf.* J. F. H. Broadbent and Sir William Broadbent, *Practitioner*, May, 1895.

In the employment of this powerful therapeutic agent certain precautions are essential. The patient should not at first be bathed in the unmitigated Nauheim water. Schott advises at the beginning of treatment a bath containing 1 per cent. of chloride of sodium and 1 per 1000 of chloride of calcium, and free from carbonic acid gas. The gas is liberated by causing the water, as it issues from the spring, to gush up in the form of a fountain, the carbonate of iron being oxidized in the process. The water after this treatment is of a reddish-brown color, this tint being imparted to it by the oxide of iron. The temperature of the early baths should range from 92° to 95° F., and the patient should be immersed from six to eight minutes.

Dr. Bezly Thorne,[1] in order to determine whether the virtues of the Nauheim waters are dependent upon their mineral ingredients, performed the following auto-experiment: He immersed himself for the space of ten minutes in three different kinds of water, namely, (1) the ordinary water of London; (2) the waters of Llangammarch Wells in Breconshire, (3) the water of the Nauheim spring No. 7. The composition of London water is certainly not such as to entitle it to the term "mineral," while that of Llangammarch Wells contains 2.7 of chloride of sodium, 1.2 of chloride of calcium, and 0.09 of chloride of barium per 1000, and the water of the Nauheim spring in question contains about 22 parts of chloride of sodium and about 1.7 of chloride of calcium per 1000. In order to test the effect of the mineral ingredients alone the Nauheim water was freed from the carbonic acid which it naturally contains in such large amount. The temperature of the water in these experiments was 90° F. The immediate effect upon the pulse, in each instance, was a diminution of frequency proportional to the rate before immersion and a marked increase in volume, but here the resemblance ceases. In the plain water there was a sense of coldness during the last two or three minutes which was only removed by brisk towelling, while in the saline baths there was continuously a glow of warmth and a sense of well-being. The contrast afterward was still more marked, for the feeling of exhilaration and vigor produced by the saline baths was entirely absent after immersion in ordinary water. As the result of his experiments, Thorne believes it "correct to say that, in respect of therapeutic influence on a disabled heart and an impaired circulation, fresh-water baths may be dismissed from consideration."

During the first few minutes of immersion in the Nauheim water there is often a sense of oppression in the epigastrium attended with labored breathing, coincidently with which the area of cardiac dulness undergoes a diminution in its oblique transverse diameter to the extent of one-third to one-half inch in the healthy, while in those with

[1] *British Medical Journal*, March 9, 1895.

dilated heart it may amount to one inch or more. The liver also, if enlarged, may be observed to undergo a marked diminution in size. As a result of the improved tonicity of heart and arteries the bath is followed by free diuresis which often sets in on the first day of treatment and may continue throughout its course.

The other portion of the Schott method is a species of gymnastic exercise which is aptly characterized by the German term *Widerstand-gymnastik*, and consists of a series of movements of the upper and lower extremities and the trunk which are gently resisted by a carefully trained assistant. These movements are of the simplest description, and need not be described in detail, since it is highly probable that any movements of flexion and extension of the extremities and rotation of the trunk which call into play the principal muscles of the body will accomplish precisely similar results. Gentle resistance to these movements undoubtedly adds to their efficacy.

The effect of these exercises, which, be it remembered, are of a very gentle character, is very similar to that of the baths, although they do not reduce the frequency of the pulse in so marked a degree. The baths also are believed to exert a more profound influence on the nutrition of the tissues of the heart and blood-vessels and on those of the system in general. Be that as it may, the combined effect of the baths and exercises is, in the opinion of Thorne, such as to "throw the action of drugs completely into the shade."

Mode of Action of the Baths and Exercises.—The effects produced by the baths are thus accounted for by Thorne: It is well known that there is less blood in the body than can fill the entire vascular system at the same time and that the vessels of the muscular system can expand to such an extent as to "allow the arterial blood to pass through them alone as quickly as it usually does through the vessels of the skin, intestines, and muscles together." The effect of immersion in a bath of which the temperature is from 3° to 10° F. lower than that of the body is to contract the cutaneous vessels and determine the blood to the muscles, the vessels of which become greatly dilated. The effect of such dilatation is not only to diminish peripheral vascular resistance and, consequently, to ease the heart, but also to increase oxidation, calorification, and metabolism in an enormous vascular district—that of the muscles. At the same time the mineral ingredients and carbonic acid contained in the bath-water stimulate the cutaneous nerves, prevent chill, and favor reaction, so that, after the bath, the vessels of the skin as well as those of the muscles are dilated. The gentle muscular exercises act in precisely the same manner—*i. e.* by promoting vascular dilatation in the muscular system. The blood, by this combined method, is transferred from the veins where it has been a "vehicle and a store of poisonous ingredients,

to the arteries in which it flows a purified and oxidizing steam." At the same time the vascular capacity is so increased as to "afford to a laboring heart the relief which would arise from free venesection without despoiling the system of one drop of blood. Accumulation of blood in the heart and veins tends to death; transfer of the excess to the arteries and capillaries is life."

The foregoing remarks concerning the effect of the Schott method upon the distribution of the blood must not be regarded as plausible deductions derived from its manifest operation in easing the heart and relieving the signs and symptoms of passive congestion. On the contrary, the Schott method is based upon well-known physiological laws, the knowledge of which must be taken for granted.

The effect of this mode of treatment in relieving the numerous symptoms dependent upon venous stasis is often remarkable. The engorgement of the gastric and intestinal vessels being relieved, digestion improves and appetite returns. The breathing becomes freer. The condition of the blood improves in a striking manner, as shown most conspicuously by a return of healthy color to lips and cheeks; and œdema, ascites, and hydrothorax, if present, diminish or disappear entirely. The effect upon the mind is still more striking, despondency and gloom being replaced by cheerfulness and hope.

The Schott system does not restrict the amount of water ingested. On the contrary, it encourages its free imbibition, on the ground that the blood of those who have been long suffering from venous stasis is a reservoir of uric acid and other excrementitious substances which, if not speedily eliminated through the medium of the ingested water, are, at least, deprived of a portion of their toxicity by dilution. Nitrogenous food is also freely permitted, and an abundance of succulent vegetables, while the carbohydrates are allowed more sparingly on the ground that they tend to the formation of acids and fat—still, as regards diet, each case must be separately studied, for, in the opinion of the writer, many cases of cardiac valvular disease progress more favorably upon a diet in which nitrogenous food is reduced to a minimum.

Artificial Preparation of the Baths.—Patients who are unable to visit Nauheim are not necessarily debarred from the employment of the Schott method of treatment. In fact Dr. Schott himself has given directions by which an artificial Nauheim bath may be prepared by any one. Mr. William Armstrong of Buxton[1] has employed the artificial Nauheim bath in his own practice in cases of advanced cardiac disease with failing compensation, and states that the results thereby obtained have far exceeded his expectations. The proportions of solids in the successive baths are carefully graduated,

[1] *Liverpool Medico-Chirurgical Journal*, vol. xv., 1895, p. 491.

the patient beginning with a comparatively weak solution of salts, to which later in the course of treatment, carbonic acid gas is added.

The following directions for the preparation of the baths are given by Armstrong, it being understood that the amount of water in each bath is 40 gallons:

Bath No. 1: Sodium chloride, 4 lb.; calcium chloride, 6 oz.
" " 2: " " 5 "; " " 8 "
" " 3: " " 6 "; " " 10 "
Sodium bicarb., 8 oz.; acid. hydrochlor., 12 oz.
" " 4: Sodium chloride, 7 lb.; calcium chloride, 10 oz.
Sodium bicarb., 8 oz.; acid. hydrochlor., 12 oz.
" " 5: Sodium chloride, 9 lb.; calcium chloride, 11 oz.
Sodium bicarb., 1 lb.; acid. hydrochlor., 1½ lb.
" " 6: Sodium chloride, 9 lb.; calcium chloride, 12 oz.
Sodium bicarb., 1½ lb.; acid. hydrochlor., 2½ lb.

The maximum strength is reached at the sixth bath, but it does not necessarily follow that bath No. 6 is taken on the sixth day of treatment. The strength of the baths is increased in accordance with their effects upon the condition of the patient.

The only diseases in which the baths are either contraindicated or to be employed with the greatest circumspection, are aneurism and angina pectoris, the genuine angina of Heberden.

I have dwelt at some length upon the Schott method, first, because it fulfils in the completest possible manner the indications furnished by the conditions of the circulation in cases of failing cardiac compensation; and, secondly, because, while it has been endorsed by many of the leading physicians of Europe, it has, thus far, received little or no attention in this country. At the present day there is little or no difficulty in introducing a new drug into the best society—the *ipse dixit* of an enterprising manufacturer is all-sufficient for that purpose. The case, however, is very different with a *system* of treatment, whether dietetic or hygienic, even though it be based upon universally acknowledged laws of physiology or hygiene. For a time, which is usually protracted, the latter has to maintain a struggle for existence, but in the end it is bound to survive.

Medicinal Treatment of Valvular Heart Disease.—By a careful regulation of the diet, the occupation, the amusements and sports, the hours of sleep and the functions of the digestive organs—in short, by the observance of the laws of hygiene, the necessity for employing drugs addressed directly to the heart and blood-vessels—the cardio-vascular tonics—may, in many cases, be almost indefinitely postponed. Sooner or later, however, in the majority, the time arrives when such remedies are imperatively needed, and of them all, digitalis is still universally acknowledged to be *facile princeps*. While I can-

not entirely coincide with Huchard's statement that without digitalis there would be no cardiac therapeutics,[1] I am convinced that all the other tonics are, at best, but succedanea to that invaluable drug. It would be out of place to discuss the question of the *modus operandi* of digitalis, especially as it is still unsettled. It is enough for the clinician to know that under its influence the ventricular contractions become stronger, slower, and more regular, and that the tonicity—the tension—of the arteries is increased. There is a certain physiological antagonism between the arterial and venous systems, the maintenance of which is essential to a perfect circulation. The tendency of every variety of valvular heart disease is to destroy this antagonism, and the object of treatment is to restore it. Failing compensation is synonymous with exhaustion of the heart and arteries. The tension of the latter becomes relaxed, they are ready to abandon the struggle, and the entire circulation approaches a venous type. The latter fact is further indicated by a scanty secretion of urine, by œdema, and often also by a subnormal temperature. The object of treatment, under these circumstances, is to strengthen the heart and at the same time to increase the arterial tension, and this may be most successfully accomplished by digitalis. There are certain facts concerning this drug and its indications which need to be set forth in some detail.

The first requisite to the successful employment of digitalis is the presence of more or less healthy muscular fibre in the heart, for it can no more act in the absence of muscular fibre than can electricity traverse a divided nerve. Is there any method by which we can judge of the degree to which degeneration of cardiac muscular fibre has advanced? We are justified in inferring the presence of considerable healthy muscular fibre if the first sound is, as in health, louder, deeper toned, and more prolonged than the second, and if the apex-beat, instead of being diffuse and faint, is sharply defined and plainly palpable. Again, a distinct murmur can only be produced by a heart acting with considerable force, so that a faint murmur coinciding with signs of failing compensation is of more serious import than a distinct one. The response to appropriate treatment is, however, the best of all tests of the condition of the cardiac muscle.

Another indication for the employment of digitalis is weakness and irregularity of the pulse. Wihering, who wrote a treatise on digitalis toward the close of the last century, and who probably did more than any one else to bring the drug into judicious use, had the sagacity to perceive that it is much more efficacious when the pulse is feeble and intermittent than when it is hard and regular. Although the phrases "high and low arterial tension" were not then invented, the treatment of this keen observer was just as skilful as though they were.

[1] "La thérapie cardiaque serait impossible sans la digitale."

The next question we have to consider is whether the success which follows the use of digitalis is due to the nature of the lesion; *i. e.* whether the indications for the employment of this drug depend upon the valve affected and the nature of the circulatory disturbance to which it gives rise. The question has given rise to a great deal of profitless discussion, owing to the fact that most observers have approached their cases of heart disease with preconceived opinions derived from authoritative teachers. For example, Grisolle, one of the most distinguished physicians of his time, declared digitalis to be not only useless but injurious in all such valvular lesions as give rise to stenosis. In 1867 Lelion,[1] in his inaugural thesis, expresses an opinion exactly the reverse, for he says that digitalis is indicated in stenosis of the valvular orifices; contraindicated in those which give rise to insufficiency.

In 1877 Milner Fothergill adopts the same view, so far as aortic stenosis is concerned. Digitalis, says Fothergill,[2] is "useful in aortic stenosis. By exciting a more powerful ventricular contraction it enables a larger amount of blood to be driven through a narrowed orifice in an equal time, thus establishing a new equilibrium."

Niemeyer, on the other hand, held that digitalis was, as a rule, contraindicated in aortic stenosis, and advised that, in this form of heart lesion, it should only be employed in cases in which compensation is failing or the action of the heart is so rapid as to prevent the proper discharge of the contents of the left ventricle.

The same differences of opinion have prevailed with reference to the use of digitalis in lesions of the mitral orifice. Niemeyer advised its use in mitral stenosis, on the ground that by slowing the action of the heart it gave the left auricle more time in which to discharge its contents into the left ventricle. On the other hand, Potain maintained that it was in just these cases of mitral stenosis that digitalis could be most easily dispensed with.

Gubler, a well-known French authority, held that both in mitral insufficiency and stenosis, little benefit was to be derived from digitalis.[3]

These are but a tithe of the contradictory statements with reference to the best cardiac tonic in the Pharmacopœia. Can they be reconciled, and, if so, in what manner? Certainly not by endeavoring to impeach the testimony of the distinguished men I have quoted. They are all partly right and, therefore, none of them entirely wrong. The cause of their discrepant statements concerning the action of digitalis is to be found in the stage of the disease in which they employed it. In the same case of valvular heart disease, digitalis may

[1] Quoted by Huchard.

[2] *British Medical Journal*, Oct. 13, 1877.

[3] *Cf.* Huchard: "Quand et comment doit-on prescrire la digitale?"

be found decidedly injurious in one stage, useless in another, and decidedly beneficial in the third.

With reference to the action of digitalis, cardiac valvular disease has been divided into three stages: 1. Eusystole; 2. Hypersystole; 3. Hyposystole. In the first, compensation is fully made for the valvular defect. There is no dyspnœa except on decided exertion, no palpitation, no cough, no œdema, or any other sign of venous stasis. Under such circumstances, digitalis is not indicated; it is absolutely useless, and might be injurious. The only treatment to be advised is of a strictly hygienic nature.

At a later stage of the same case the symptoms may have undergone a very decided change. The heart has enlarged; there is a tendency to active congestion, manifested by fulness of the head, cephalagia, tinnitus aurium, vertigo, and insomnia. The impulse of the heart is powerful and outside of and below its normal situation, while the pulse is full and resistant. Under such circumstances as these, digitalis is decidedly injurious, and since this stage is more pronounced in cases of aortic valvular disease, especially aortic regurgitation, the hasty inference has been made that digitalis is injurious in all cases and stages of aortic lesion. The bromides, morphine, and aconite are the drugs for this stage of valvular disease, but the most important rôle is still to be assigned to hygiene. Rest in bed, and a bland diet of which the only animal ingredients are milk and eggs, should be prescribed, and a rigid abstinence from alcoholic liquors, tea, coffee, and tobacco enforced. The stage just described is that of hypersystole.

The stage of hyposystole may be said to begin when there is dyspnœa on slight exertion or even in ordinary conversation, œdema about the ankles, at first only observed at night on retiring, and a scanty secretion of urine. There will also be failure of appetite and other signs of digestive disturbance due to disordered circulation of the gastro-intestinal tract. These symptoms coincide with diminished arterial tension; perhaps also with feebleness, irregularity, and intermittence of the pulse. It is in this stage of heart disease that digitalis is employed with most brilliant results; and as this stage may be reached in any case of heart disease, irrespective of the valve affected, it follows that the true indications for the drug are to be found rather in the symptoms of cardiac affections than in their physical signs.

It is undoubtedly the case that certain valvular affections are, as a rule, more benign in their course than others, and may last for years without giving rise to any decided symptoms, the patient finally dying of some intercurrent affection. The indications for digitalis, in such cases, may never arise unless exposure to cold and wet or other depressing causes induce a state of acute cardiac insufficiency.

The facts above mentioned afford the only satisfactory explanation of the discrepant statements with reference to the employment of digitalis in heart disease.

I trust I have made it plain that the indications for digitalis are to be found only in the functional capacity of the cardiac muscle. When it is working regularly and overcoming the valvular obstruction without exhausting the reserve force inherent in every heart, digitalis is useless and may be injurious. When the heart is excited in its action—that is, when it is making superfluous efforts to overcome the obstruction, provided this coincides with increased arterial tension, digitalis is decidedly injurious. When the arterial tension is low, and the whole circulation is approaching a venous type, digitalis is decidedly beneficial. These statements apply to all cases of heart disease, irrespective of the particular valve or valves involved.

On prescribing digitalis in a given case and obtaining no immediate results, it should not be hastily concluded that the drug is useless. Although the fact has been denied, there can be no doubt that its action is cumulative, and, therefore, sometimes not manifest until it has been continuously administered for two or three days. Its effect also persists for several days after its withdrawal. On these accounts, Huchard has formulated the law that digitalis should be prescribed in progressively diminishing doses.

There are certain effects of digitalis which are often attributed by the inexperienced to the disease for which it is prescribed. For example, while slowing and strengthening the pulse, it often makes it very unstable—so much so that the least excitement may cause it to increase in frequency at the rate of from twenty to thirty beats per minute. The same result is produced by slight muscular exertion, such as turning over in bed. For these reasons the best results from digitalis are obtained by keeping the patient at rest while he is taking it. When the circulatory equilibrium is thoroughly restored by the use of the drug, the patient may be allowed to rise and take a proper amount and kind of exercise.

In valvular disease, where the patient is taking digitalis, the physician should occasionally compare the number of the pulse-beats with those of the heart. Cases are occasionally encountered in which the number of heart-beats is greater than that of the pulsations of the radial artery. This is due to the fact that some of the heart-beats are abortive or, if not entirely so, are too weak to occasion a palpable pulse at the wrist. The number of the cardiac pulsations may be exactly double those of the radial artery, and, in the opinion of some authorities, this is due to an asynchronous contraction of the two sides of the heart. I have published a case in which this condition seemed to

exist.[1] The possibility of the independent action of the right and left ventricles has been denied, and when we consider the manner in which the spiral, circular, and other muscular fibres pass from one ventricle to another without any tendinous septa or other lines of demarcation between them, it is difficult to understand how this can occur; in the case to which I refer, however, the sphygmograph recorded two beats of the heart to one of the radial pulse, and the relation of the curves representing the double heart-beats was, in point of volume, just what would be expected from the relative strength of the two ventricles.

I mention these peculiarities of cardiac action because they have been attributed to the action of digitalis. The question whether or not they are due to the drug is, I believe, an open one. There is one form of cardiac action which is generally acknowledged to be due to digitalis. It is a species of regular irregularity manifested by what has been called the "pulsus bigeminus," *i. e.* there are two rapid beats of the heart separated by a long interval, and this may continue for hours.[2]

Modes of Administering Digitalis.—The physician, in prescribing digitalis, should convince himself, as far as it is possible for him to do so, that the preparation he is employing is an active one. Nothing, in my experience, has impressed me more than the marvellous effect of digitalis in cases of cardiac incompetence, and when it fails I at once suspect either that there is something faulty in the preparation of the drug or that it has not been absorbed. In some cases the latter surmise is correct, and, therefore, before condemning the drug we should employ the means at our command to promote its absorption. In many cases in which the veins are clogged, the viscera congested, and the lymph-spaces and serous cavities distended with fluid, the administration of digitalis may advantageously be preceded by energetic purgation with a concentrated solution of magnesium sulphate or other saline, or even by venesection. The latter, in my experience, is rarely necessary. I have, in apparently desperate cases, obtained results which left nothing to be desired, by the simultaneous administration of digitalis and saline purgatives.

The preparations of digitalis commonly employed are the infusion, tincture, powder, and fluid extract. The infusion, which many clinicians regard as the most effective preparation, may be given in doses of half an ounce every six hours, or even more frequently, until the pulse is reduced in frequency and made tenser, when it should be discontinued, or administered at longer intervals or in smaller doses.

[1] *Archives of Medicine*, Aug., 1881.

[2] See "Digitalis in Valvular Disease of the Heart," by F. P. Henry, M. D., *Medical and Surgical Reporter*, Nov. 22, 1890.

The disadvantages of the infusion are its bulk and its taste, which to many patients is somewhat nauseating. On these accounts many prefer the tincture, which is also regarded by some authorities as possessing a more powerful diuretic action. I cannot agree with the latter opinion, believing the diuretic action of digitalis to be a secondary phenomenon dependent entirely upon its action upon the heart and blood-vessels. An advantage of the tincture is that it is more apt to be of uniform strength than the infusion. The latter should be freshly made from the leaves for each prescription, and therefore variations in the amount and quality of the active ingredients may, for manifest reasons, occur. It is impossible to formulate any fixed rules with reference to the dosage of the tincture, but at the beginning of treatment of an urgent case it is usually safe to administer 15 minims every three hours until 2 drachms have been taken. The dose should then be reduced to 10 minims at the same intervals or to 15 minims three times a day. It may be continued almost indefinitely in doses of 10 minims twice or thrice daily, always, be it understood, under the supervision of the physician.

The powder is a very effective preparation. Sansom considers the tincture the most reliable of the preparations of digitalis and the powder the second in rank. If I were to judge solely from my own experience I would place the powder first. I could relate the histories of several cases in which the patients were rescued from impending death by the use of 1-grain doses of the powder, in combination with purgatives and diuretics. One such case I recently saw in consultation with Dr. Haydon, the patient being a man about sixty years of age, whose legs, scrotum, and peritoneal cavity were distended with serous effusion, and whose general condition was most pitiable. The preparation of digitalis recommended by me was the powder, and none other was given. In the course of three or four weeks this man, whom we had fully expected to die, was able to walk from his house to Fairmount Park—a distance of at least a quarter of a mile.

It is not unlikely that the excellent results so often obtained from the powder are in part due to the fact that it is almost invariably given in combination with other substances and especially with diuretics and diaphoretics. A favorite prescription of my own, and, in fact, the one employed in the above-mentioned case, is the following:

℞. Pulv. digitalis, ℈j (1.3);
Potass. nitratis, ʒj (4.0);
Pulv. ipecac. et opii, ℈j (1.3).
M. et div. in chart No. xx.
Sig. One powder every three hours.

Powdered squill may be substituted for the nitrate of potash, and may sometimes be found more effective as a diuretic; or a purgative may be substituted or added. The combination of 1 grain each of powdered digitalis, powdered squill, and calomel, is a time-honored one and undoubtedly one of the best, but I think it is a mistake to administer it in pill form, as is often done. The powder is much more readily absorbed. Sometimes an active cathartic effect, in combination with that of digitalis, is desirable, in which case from 1 to 2 grains of powdered scammony may be added to each powder, as in the following prescription:

℞. Pulv. digitalis,
Pulv. scillæ, āā. ℈j (1.3);
Pulv. scammonii, ℈ij (2.6).
M. et div. in chart No. xx.
Sig. One powder three times a day.

The compound extract of colocynth, in similar doses, may be substituted for the scammony in the last prescription, in case of the failure of the latter to purge efficiently.

An active condition of the bowels is not only, in itself, beneficial in most cases of hyposystole, but is also conducive to the favorable action of digitalis, and it is my usual custom to direct the patient, while taking the latter drug, to take also every morning, or every second morning, a saline cathartic. The dose of the cathartic need not be large. What we wish to obtain is a daily watery evacuation, and this may, in most cases, be secured by the use of a drachm or two of magnesium sulphate in a glass of water before breakfast. The patient may be directed to dissolve one ounce of Epsom salts and half an ounce of cream of tartar in a pint of hot water and set it aside in a bottle. Of this solution he may take four ounces every morning on an empty stomach. My best results in the treatment of valvular heart disease in advanced stages have been obtained by some such simple saline mixture in combination with digitalis, and especially with the powder in one or other of the above-mentioned combinations.

Under the head of *digitaline* is included a number of substances extracted from digitalis, which may be divided into two groups: 1. Substances soluble in chloroform and insoluble in water—crystallized digitaline, amorphous digitaline, and digitoxin. 2. Substances insoluble in chloroform and soluble in water—digitalcine and German digitaline. According to Fouquet and Barié[1] the substances of the first group possess, when pure, the same degree of activity as, and are to be preferred to, those of the second group.

[1] *Thérapeutique des Maladies du Cœur*, Paris, 1894.

There are great differences of opinion concerning the virtues of these various so-called alkaloids, but in the writer's judgment digitoxin is the most uniform as to chemical composition and therapeutic activity.

Nativelle's crystallized digitaline, which is strongly recommended by Balfour, is probably largely composed of digitoxin. Writing in 1876[1] he endorses it, and nearly twenty years later,[2] he states that it "is now and always has been a thoroughly reliable and active drug." Each granule contains $\frac{1}{4}$ milligramme of "digitaline"—equivalent to about $\frac{1}{250}$ grain—and is equal in strength to ten minims of the tincture and one grain of the powdered leaves. It can be administered both *per os* and hypodermically, and is of special service in the latter form in cases of intense gastro-intestinal congestion where absorption takes place with great difficulty. The hypodermic administration of this preparation, or, in fact, of any active preparation of digitaline is necessarily painful, owing to the fact that the drug is insoluble in water, this being a *sine quâ non* of activity. It is, however, readily soluble in dilute alcohol.

The above estimate of the strength of Nativelle's digitaline, which is given on the authority of Balfour, is probably incorrect, for the same author states that if more than two of the granules are given by the mouth in one day, nausea and vomiting are apt to ensue. Certainly, no physician could hope for any marked results from two grains of the powdered leaves, or twenty minims of the tincture of digitalis, which, according to Balfour, are the equivalents of two of Nativelle's granules.

Substitutes for Digitalis.—Although authorities may differ as to the relative merits of the various preparations of digitalis, they are all practically united in the belief that nothing can completely take its place. Of the numerous succedanea for digitalis the chief are strophanthus, convallaria, sparteine, caffeine, casca, adonidine, arsenic, and the chloride of barium. For most of our knowledge of the first mentioned, which is undoubtedly the best, we are indebted to the admirable researches of Professor Fraser of Edinburgh.

The wide differences of opinion that have prevailed and are still current concerning the action of *strophanthus*, render the conclusion inevitable that this drug is a more uncertain and less powerful heart tonic than digitalis. Out of 120 cases Fürbringer obtained favorable results in but 30, and these were mostly cases of dilatation without valvular lesion. Very similar results were obtained by Fränkel. On the other hand, Bucquoy regards strophanthus as a cardiac tonic of the first rank, even superior in some respects to digitalis; for, while it strengthens the heart and promotes diuresis, it is non-cumu-

[1] *Clinical Lectures on Diseases of the Heart and Aorta.* [2] *The Senile Heart*, 1894.

lative and does not give rise to nausea. The only symptom of intolerance observed by Bucquoy was a painless diarrhœa which is often beneficial. According to the United States Dispensatory (17th edition) it is probably superior to digitalis as a diuretic, exerting its action not only indirectly through rise of blood-pressure, but also directly through its supposed action upon the secreting cells of the kidney.

From clinical observation, I am convinced that strophanthus increases decidedly the force of the cardiac contractions and lessens their frequency, but I cannot coincide with the view that it is a more powerful diuretic than digitalis. Probably, the best method of employing strophanthus is to perpetuate the effect initiated by digitalis. For example, after five or six days' use of the latter, strophanthus may be prescribed, and in virtue of its non-cumulative action may be continued as long as the patient's condition is favorable. At any time when the heart shows signs of flagging, digitalis should be resumed. A tincture of strophanthus of the strength of 1 : 20 has been added to the last edition of the U. S. P., and should be given, at first, in doses not exceeding 5 minims. The glucoside strophanthin has been isolated, but has been too little employed by clinicians to warrant its recommendation.

Sparteine is most commonly employed in the form of the sulphate, which may be given either in pill or solution in doses of one-fourth to one-half grain. The late Dr. Edward T. Bruen of Philadelphia found this salt to possess considerable diuretic power in "intractable dropsy due to heart-failure, caused by the dilatation secondarily following hypertrophy." He believed also that it increased the strength of the heart's action and reduced its frequency. He, however, found it to induce a sensation of numbness in the lower extremities, and in one case paralysis—symptoms which, he says, might be expected from its physiological action. He believed also that sparteine exerted cumulative effects, and advised caution in administering larger doses than one-fourth grain three times a day.[1] I have used sparteine sulphate with what seemed to me good results in cases of slight cardiac incompetence, and have thus far observed no toxic effects from it, although I have been accustomed to prescribe it in doses of one-half grain.

The extract of *convallaria* in 5-grain doses has been employed by Sansom with success in valvular affections. He found it to increase the intravascular pressure and to strengthen the cardiac systole. I have had little experience with this drug.

Caffeine is most successful in cases in which œdema is a prominent symptom, and is, unquestionably, a powerful diuretic. The alkaloid

[1] *University Medical Magazine*, Jan. 1889.

is decidedly superior to the citrate, although the latter is commonly prescribed, and should be given in doses of from 3 to 6 grains. It is most effectively used in connection with digitalis. On account of its tendency to produce insomnia it should be given mostly during the morning hours.

Arsenic is of decided value as a heart and nerve tonic, and may be administered during the intervals in which the use of digitalis or strophanthus is suspended. Balfour esteems it very highly, ranking it, in fact, next to digitalis, and finds it of special service in cases attended with anginal symptoms.

The positions of adonidine and chloride of barium, in the treatment of valvular disease, are decidedly subordinate, while that of casca, lauded by Lauder Brunton, is still more uncertain.

Bleeding.—In a certain number of cases, a critical evacuation of blood, whether as the result of accident or design, may turn the scale in favor of recovery when otherwise death would inevitably ensue. An instructive instance of the beneficial effect of loss of blood in an advanced stage of hyposystole, is related by Dr. Bedford Fenwick.[1] The case was in the London Hospital, under the care of Dr. Andrew Clark, by whom it had been classified as one of mitral stenosis with aortic incompetence. Digitalis, ether, and senega were given with little benefit. "The urine became scantier, œdema increased, and coma seemed supervening." At this juncture the patient accidentally struck his nose during the night and lost from twelve to fourteen ounces of blood. This accident was followed by immediate and decided improvement; so much so that "in less than a week the œdema was perfectly gone, his pulse was 80, his respiration 24, his appetite was becoming voracious, and he insisted on returning home, feeling better, he said, than he had done for months."

Herman Allyn reports a similar case,[2] and Fenwick gives the details of six cases which were all benefited more or less by the abstraction of blood. The following conclusions with which he ends his paper are endorsed by my own experience:

"1. In cases of valvular stenosis, if dyspnœa or pain or urgent symptoms be present, bleeding is generally useful. It appears to be better to bleed often if necessary, but to take only a small quantity each time, and this by means of leeches or the cupping-glass direct from the cardiac region.

"2. In cases of valvular incompetency, if urgent dyspnœa or cyanosis or stupor be present, it appears best to bleed freely from the arm to about sixteen or twenty ounces if necessary, and, if possible, once for all."

[1] "On the Use of Venesection in Cases of Heart Disease," *Lancet*, Aug. 5, 1882.

[2] *University Medical Magazine*, April, 1894.

Treatment of Special Symptoms.—For the gradually increasing *dyspnœa* which attends progressive failure of compensation we possess no specific remedies other than digitalis and its congeners. Benefit, in such cases, may sometimes be derived by increasing the dose or changing the preparation of digitalis or by resorting to the use of strophanthus, sparteine, or caffeine. As a rule, however, it will be found that *gradually increasing* dyspnœa unrelieved by digitalis is not benefited by anything else.

Sudden accessions of dyspnœa are much more amenable to treatment. They may be due to a variety of causes, chief among which are bronchial catarrh, spasm of the bronchial vessels (pseudo-asthma), genuine spasmodic asthma, acute pulmonary congestion, pulmonary œdema, renal insufficiency, etc.

A bronchial catarrh supervening in the course of valvular disease should be promptly treated with counter-irritation (dry cups, sinapisms, etc.), absolute rest in bed, and the internal administration of carbonate of ammonia in combination with digitalis and balsamic substances such as ammoniac, tolu, wine of tar, and terebene. Ipecac should be prescribed with caution, lest vomiting be excited, and preferably in the form of the wine. Morphine is often of decided benefit under these circumstances, and, in small doses, is a cardiac stimulant. The following prescription, which I have used with advantage in the bronchial catarrhs of heart disease, may be taken as a type of the medication I advise:

℞. Ammoniac., Tinct. tolut., *āā* ʒij (8.0);
Tinct. digitalis, ʒi–ʒij (4.0–8.0);
Morphinæ sulph., gr. ss (0.03);
Pulv. acaciæ, ʒij (8.0);
Aquæ, ad ℥vj (180.0).—M.
Sig. One tablespoonful every three or four hours.

Ammonium carbonate may often be advantageously added to the above prescription. When the dyspnœa has diminished and the catarrh is subsiding, potassium iodide, in combination with the aromatic spirit of ammonia, will be found of service.

Dyspnœa dependent upon spasm of bronchial arterioles is generally a uræmic manifestation, and it may be speedily relieved by the cautious inhalation of nitrite of amyl, after which nitro-glycerin in doses of $\frac{1}{100}$ grain three or four times a day should be prescribed. Better results may sometimes be obtained from nitro-glycerin in much smaller doses more frequently repeated. As recommended by Whitla, $\frac{1}{1000}$ of a grain every fifteen minutes or half an hour, may be given,

and by this mode of administration the headache, flushing of the face, and sense of fulness in the head often consequent upon the usual dose, may be avoided. At the same time, saline cathartics should be exhibited with the view of eliminating excrementitious substances.

The occurrence of spasm of the bronchial tubes (genuine spasmodic asthma) is, I believe, favored by valvular heart disease and should be treated in the usual manner, always bearing in mind, however, the importance of avoiding cardiac depressants such as chloral hydrate.

It is difficult, perhaps impossible, to draw a line of demarcation between the dyspnœa of acute pulmonary congestion and that of œdema of the lungs, and since the greater includes the less I will limit my remarks, under this head, to the treatment of the latter. The dyspnœa of œdema of the lungs is only equalled by that of membranous laryngitis. Unlike the latter, however, it is not of an inspiratory type, it being difficult to decide, in cases of œdema, which of the two respiratory acts is the more embarrassed. As the œdema progresses, the respiration becomes more rapid and labored and the usual signs of asphyxia appear. The skin and mucous membranes assume a cyanotic appearance; the sensorium becomes dulled; the patient falls into a semi-comatose state; the muscles twitch, and, finally, general convulsions set in and are soon followed by death. In most cases there is an abundant expectoration of frothy serum; in fact, this material, which is often tinged with blood, may issue from the mouth without any act of coughing, requiring to be frequently wiped from the patient's lips.

The prognosis is always most serious, but I have seen recovery take place, under suitable treatment, when the condition of the patient was apparently hopeless. I recall the case of a woman whose pulse was too rapid to be counted, whose chest was filled with bubbling râles, from whose mouth a blood-tinged frothy serum was constantly welling, and who nevertheless recovered, only to die several months later in a similar paroxysm.

In cases of œdema pulmonum the action of the heart must be maintained and strengthened with alcohol and ammonia and the hypodermic administration of strychnine, and the respiratory centre stimulated with atropine, which is best employed hypodermically. It is in these cases also that benefit may be obtained from the hypodermic use of a reliable preparation of digitaline or digitoxin. In addition, dry cups and sinapisms should be applied to the chest and the feet and legs immersed in hot water. If these measures are ineffectual and the heart is laboring, the venous system may be relieved and the patient saved from impending death, by venesection.

The treatment of uræmic dyspnœa occurring in the course of valvular heart disease does not differ materially from that of the same symptom occurring independently of cardiac lesion, with one important exception, which is that neither jaborandi nor its alkaloid, pilocarpine, should ever be prescribed. The tendency of this drug to induce pulmonary œdema renders it positively dangerous in heart affections.

Digestive disorders dependent upon valvular disease are all congestive and are best treated by a combination of digitalis and saline purgatives. In addition, the greatest care should be taken with reference to diet, such foods as are generally acknowledged to be indigestible, such as veal, pork, and salmon, being rigidly prohibited. An individual with heart disease should be especially careful to secure a daily evacuation of the bowels and may take with advantage twice or thrice weekly a dose of one of the stronger saline mineral waters or a teaspoonful or two of Sprudel salt dissolved in a glass of hot water. The same measures which are recommended for the treatment of gastro-intestinal congestion are applicable to that of the liver and kidney. There is a tradition, apparently well founded, that calomel exerts an antiphlogistic action upon the liver. Be this as it may, there is no question concerning the diuretic action of this drug in cases of heart disease. It is, therefore, peculiarly appropriate in cases of portal congestion, inasmuch as it not only depletes the vessels of the gastro-intestinal tract but, at the same time, increases the secretion of urine. It may be given for these purposes to the extent of from 5 to 7 grains *per diem,* in divided doses.

Œdema and Serous Effusion.—The earliest undoubted sign of failing compensation is œdema, which first manifests itself in the evening in the feet and about the ankle-joints. Up to the appearance of this sign, the condition may have been one of "eusystole," and may still deserve that term so far as the subjective symptoms are concerned. Œdema of dependent parts, however, indicates a degree of diminished arterial tension which calls for digitalis, and which, under the use of this drug, together with mild saline purgation, may promptly disappear. The physician, however, frequently encounters cases in which, either through neglect or inefficient treatment, the œdema is widespread and associated with effusion into the large serous cavities. In such cases the loose tissues of the scrotum are often enormously distended and may envelop the penis to such an extent that micturition is accomplished with difficulty.

Even under such circumstances the dropsy may entirely disappear under the use of digitalis, purgatives, and diuretics. The best purgative under these circumstances is magnesium sulphate given in the manner recommended by Hay, *i. e.* 2 ounces of magnesium sulphate

dissolved in 2 ounces of water and taken after ten or twelve hours' abstinence from food or drink. Enormous amounts of fluid may be drained away through the intestine by such a dose, which may be administered twice or thrice weekly. If the stomach cannot tolerate such a dose, the compound jalap powder, elaterium, or calomel (in a single dose of 5 grains) may be substituted. The latter is sometimes powerfully diuretic as well as purgative.

Among diuretics proper, caffeine, theobromine, and diuretin are among the best in cases of cardiac dropsy. The first-mentioned may first be tried, and should be given in large doses—5 grains three or four times daily. Barié recommends an initial dose of 1 gramme. The alkaloid caffeine should be employed in preference to any of its compounds, such as the citrate, valerianate, or bromhydrate. Caffeine may be administered to the best advantage hypodermically. The following solutions for hypodermic use are recommended by Tanret:

℞. Sodii benzoat.,	gr. xlv (3.);
Caffeinæ,	gr. xxxvii (2.5);
Aquæ destillat.,	f℥iss (6.).—M.

Each syringeful (one cubic centimetre) contains 25 centigrammes (4 grains) of caffeine, which dose may be repeated three or four times daily.

℞. Sodii salicylat.,	gr. xlv (3.);
Caffeinæ,	℥j (4.);
Aquæ destillat.,	f℥iss (6.).—M.

Each cubic centimetre contains 40 centigrammes (7 grains) of caffeine.

Theobromine (dose 5–15 grains several times daily) may be passed by in favor of diuretin, which is a sodio-salicylic compound of theobromine and is more efficient than the latter. It may be given, in divided doses, to the daily amount of from 50 to 120 grains, although 5 grains every two hours at first, later every three hours, are usually effective. The following formula for the administration of diuretin has been recommended:

℞. Diuretin,	4 to 6 parts;
Aquæ menth. pip.,	100 "
Aquæ destillat.,	90 "
Syr. simp.,	10 " —M.

Two tablespoonfuls every two or three hours.

There are cases in which the effusion, subcutaneous and serous, remains uninfluenced by any of the above-mentioned internal reme-

dies, presumably because they are not absorbed. Under such circumstances we may imitate the process by which nature often relieves excessive tension, by puncturing the skin of the legs and scrotum with a lance-shaped needle. By this method several litres of serum may be evacuated in the twenty-four hours, and when the pressure upon lymphatics and veins is thus diminished the internal remedies are more likely to become operative. It must be confessed, however, that both discomfort and danger to the patient arise from this simple procedure: discomfort from the moisture, which it is difficult to keep from saturating the bed-clothing, and danger from erysipelas and gangrene, which may have their points of departure from the punctures in spite of all possible antiseptic precautions. Having once excited gangrene by puncture of an œdematous scrotum, I am naturally somewhat loath to resort to this operation or to recommend it to others.

Paracentesis abdominis is rarely necessary in cases of valvular disease, but I have often had occasion to resort to puncture of the pleural sac, and with benefit. In cases of increasing dyspnœa the thorax should be carefully examined, and, if pleural effusion is detected, it should be removed. We can expect nothing from drugs in the face of such a mechanical obstruction as pleural effusion. Paracentesis thoracis, under these circumstances, is more than palliative, for it not only relieves the dyspnœa immediately, but places the patient in a more favorable position to profit by internal medication.

Syncope.—There is a form of syncope to which, so far as I know, little or no allusion is made in text-books and monographs, and of which I have seen several examples. The patients in whom I have observed it have been aged people with distinct signs of aortic stenosis and general atheromatous degeneration of the arteries. The syncopal attacks are sudden but not entirely unaccompanied with premonitions. The patient utters one or more incoherent, gasping sounds, indicative of alarm, and becomes unconscious; the pulse ceases to beat for several seconds; the face becomes ghastly pale, and respiration is imperceptible. Soon the pulse makes itself felt, very feebly and infrequently, respiration is resumed, and consciousness returns. Several such attacks may occur during the day and be repeated daily for years. An old lady under my care, who recently died in her ninetieth year, was subject to such attacks for the last two or three years of her life, which was undoubtedly prolonged by incessant watchfulness on the part of nurses and relatives. In cases of this kind I have found nitro-glycerin of the greatest service. In doses of $\frac{1}{200}$ grain three or four times daily, it may be continued, with occasional intermissions, for years. In addition the daily use of alcoholic stimulants

in moderation (two ounces of whiskey or three or four ounces of sherry) and strychnine will be found decidedly useful. The inhalation of ammonia, during the attack itself, should be resorted to. Digitalis is decidedly contraindicated in these cases, in which, in my experience, the pulse is slow, rarely exceeding 40 to the minute, and often beating for weeks at the rate of 35 to 38.

Embolism and Hæmorrhage.—There are no medicinal means of treating embolism, whether it occur in the vessels of the kidney, intestine, lungs, or extremities. I have seen death result from embolism of the femoral or popliteal artery in two cases, and, in one case, from embolism of the axillary. In none of the three was amputation thought advisable, the patients being in an advanced stage of valvular disease. In embolism of a pulmonary vessel, indicated by pain, spitting of blood, and sometimes by signs of consolidation, absolute rest, an ice-bag to the chest over the area of infarction, and small doses of morphine, are the most important therapeutic measures. Hæmorrhage from mucous surfaces is to be treated on general principles, and is sometimes, as above stated, a favorable occurrence.

FATTY OVERGROWTH AND INFILTRATION—FATTY HEART.

Fatty heart is not to be confounded with fatty degeneration of the heart, although the two may be associated. It is usually but a part of a general condition of obesity, and may be of all grades from a slight increase of the subpericardial adipose tissue normally present, to a complete envelopment of the heart in a layer of fat which may attain a thickness of more than one centimetre. Under the latter circumstances, the fat may penetrate between the muscular fibres, separating, pressing upon them, and leading to their atrophy. This constitutes the condition called fatty infiltration, and with it there is usually associated more or less fatty degeneration. It is manifest that a heart thus overloaded and infiltrated cannot properly perform its function, although it must be confessed that many corpulent individuals, whose hearts are presumably surcharged with adipose tissue, may attain a ripe old age and lead a life of considerable activity, both mental and physical. The wide variations in the cardiac symptoms of the obese are doubtless due to varying degrees of atrophy and degeneration of the heart fibres.

The causes of fatty overgrowth and infiltration are the same as those of obesity in general, viz. a luxurious and indolent mode of life and over-indulgence in the pleasures of the table, with, in most cases, an hereditary tendency to the storage of fat. The treatment should, therefore, consist chiefly in restricting the diet in accordance

with one or other of the well-known dietary systems for reducing obesity, of which the chief are those of Banting, Ebstein, and Oertel.

The principles involved in these various dietary systems are comprised in the following daily *menu*, as given by Yeo:[1]

Morning.—One cup of coffee or tea with a little milk, altogether about 6 oz.; bread, about 3 oz.

Noon.—3 to 4 oz. of soup; 7 to 8 oz. of roast or boiled beef, veal, game, or not too fat poultry, salad or a light vegetable, a little fish (cooked without fat); 1 oz. of bread or farinaceous pudding (never more than 3 oz.; 3 to 6 oz. of fruit, fresh preferred, for dessert. It is desirable at this meal to avoid taking fluids, but in hot weather, or in the absence of fruit, 6 to 8 oz. of light wine may be taken.

Afternoon.—The same amount of coffee or tea as in the morning, with at most 6 oz. of water; an ounce of bread as an exceptional indulgence!

Evening.—One or two soft-boiled eggs, an ounce of bread, perhaps a small slice of cheese, salad, and fruit; 6 to 8 oz. of wine with 4 or 5 oz. of water.

Schweninger has modified this diet by entirely suppressing all beverages at meals, only permitting fluids two hours after eating.

Another and, perhaps, the most important part of the Oertel method is out-door exercise in the form of "systematized hill-climbing." This has been widely recommended, on the authority of Oertel, by many writers who have had little or no experience with it, and has been added to the innumerable "cures" of Germany under the ridiculous, mongrel title of "Terrain-Kur." Those who have had any experience of mountain climbing are well aware of the strain it imposes upon a healthy heart and would be loath to recommend such exertion to any one afflicted with heart disease even in its mildest forms. I believe, with Burney Yeo, that the most appropriate exercise for the obese is walking on level ground, and this opinion is spreading. The method of Oertel is losing its popularity. "The painted posts and indications are, indeed, still to be seen in many a picturesque spot where the Terrain-Kur was established. The paths and indications are there, but the invalids are not!"

The Schott method of baths and exercises described in another section finds one of its best applications in the treatment of fatty heart.

Internally, the occasional employment of saline purgatives, preferably in the form of Sprudel salt, is advisable. If the patient is anæmic or chlorotic, ferruginous preparations are indicated. Thyroid extract is worthy of a trial, but should be used under careful medical supervision, as symptoms grouped under the term "thyroidismus," among which are cardiac weakness and palpitation, may attend its administration.

[1] *Food in Health and Disease.*

FATTY DEGENERATION.

This is a degeneration of the muscular fibre of the heart, and may occur without fatty overgrowth or infiltration of that organ, or the excessive deposit of fat elsewhere. In fact, it is probably most frequently encountered in spare individuals. Its principal causes are protracted anæmia, whether primary or secondary, phosphorus-poisoning, dilatation of the cardiac cavities from valvular disease, and the impaired nutrition incident to old age. The latter variety, with which the practitioner is chiefly concerned, constitutes an independent cardiac affection, while the others above mentioned are, manifestly, of subordinate importance. In my opinion, the fatty cardiac degeneration of advanced life is usually the result of protracted anæmia of slight degree. Such anæmia may continue for years without giving rise to grave disturbances of health, while all the time its denutritive action upon the heart is steadily progressing. Finally, signs of cardiac failure, such as dyspnœa on slight exertion, a sense of præcordial oppression, or an attack of syncope, manifest themselves and induce the patient to consult a physician. Stokes laid especial stress upon the diagnostic importance of three symptoms of this disease, viz. infrequency of the pulse, apoplectiform attacks, and Cheyne–Stokes breathing. The last is a late manifestation, and usually indicative of a speedily fatal termination; but the two former may be present for several years. The pulse is not always reduced in frequency, but is invariably soft and compressible and often irregular and intermittent. The first sound of the heart is short and quick, closely resembling the second, and has been well described by the term "slapping." The apoplectiform attacks, which are by no means constantly present, are the most alarming feature of the disease. They may be of daily occurrence or, as I have seen, they may recur several times daily. They consist of sudden loss of consciousness, lasting but a few seconds as a rule, during which the action of heart and lungs is suspended, and death is apparently imminent. They are doubtless due to cerebral anæmia, but differ from ordinary attacks of syncope in several particulars, and especially in the suddenness and completeness with which consciousness is regained. For example, the patient recovering from one of these attacks will often immediately resume a suspended occupation, such as knitting or sewing, or endeavor to complete an interrupted sentence. In this respect these attacks resemble those of epilepsy.

The *treatment* of this condition is chiefly prophylactic and palliative. Cases of chlorosis and anæmia should be carefully and continuously treated with the view of preserving the integrity of the heart. The disease once recognized, the patient should be warned

against over-exertion and, at the same time, encouraged to take moderate exercise, either active or passive (walking and driving) in the open air. The bowels should be carefully regulated—an important precept, for, in my experience, there is, in this disease, a tendency to obstinate constipation. Digitalis may be tried in cases in which the pulse is irregular, but, as a rule, it is of little service and sometimes seems to aggravate the symptoms. I have obtained the best results from the long-continued administration of strychnia and nitro-glycerin. The latter is especially efficacious in the cases with frequently recurring apoplectiform attacks. During the latter, inhalations of ammonia are usually sufficient to restore the patient to consciousness, and these failing, nitrite of amyl may be employed. If the patient is anæmic, as is generally the case, a bland preparation of iron such as the lactate, malate, or potassio-tartrate, or, if the stomach will tolerate it, the more efficacious sulphate, may be prescribed. Goodell's pill of sulphate of iron, extract of sumbul, and strychnine is an excellent combination, to which, if constipation exists, a little aloes powder or extract may be added.

The diet should be nutritious and easily digestible, and a little wine, two or three ounces of sherry or claret, should be taken at the midday and evening meals. A little sherry and egg (an egg well beaten up, to which is added an ounce of sherry and the same amount of water, with a little sugar) may be taken with decided advantage in the morning on rising. In addition a little milk-punch, or whiskey and water, may be taken at 11 A. M. and 4 P. M. Such an amount of stimulants is not always necessary, but, in many cases, it is decidedly beneficial. Many individuals with this affection of the heart are very small eaters and have for years been living on an insufficient diet. The improvement in their condition induced by this mildly stimulating plan of treatment, combined with tonics and laxatives, is often remarkable.

NEUROSES OF THE HEART.

Palpitation.—Palpitation of the heart may be subjective or objective, or both. It is subjective when the patient is unpleasantly conscious of the action of the heart and when, at the same time, physical examination reveals neither increased force nor frequency of its beats, nor in fact any abnormality in the behavior of the organ. This variety of the affection can only be accounted for on the hypothesis of a hyperæsthesia of the sensory cardiac nerves. On the other hand, the most violent action of the heart may be attended with few or no unpleasant sensations. Palpitation is a frequent attendant of organic cardiac disease, but with that variety we are not at present concerned. The diagnosis of nervous palpitation is only justified when the most

careful physical examination fails to detect any organic disease of the heart.

Nervous palpitation is of two kinds, the one associated with disease, functional or organic, of other organs; the other existing independently of such association, and therefore presumably dependent upon a disturbance of the nervous apparatus of the heart itself.

Palpitation in all its varieties is frequently observed at the period of puberty, and may be either a part of the general nervous erethism of sexual development or the result of masturbation. It is a frequent attendant of anæmic conditions, whether these be primary or the result of hæmorrhage, protracted lactation, acute infectious disease, or sexual excess. In the latter instance, anæmia and exhaustion of nerve-centres co-operate in its production. Other well-recognized causes of the affection are over-exertion, gastro-intestinal disorders, helminthiasis, biliary and renal calculi, floating kidney, and ovarian and uterine disease. It is probable that the uric acid diathesis is often concerned in its production.

Toxic varieties of this disorder are such as are dependent upon the use or abuse of tea, coffee, tobacco, alcohol, cocaine, and opium.

In its purest form, palpitation is best described by the term "hysterical."

One serious attack of palpitation, whether it be of toxic origin or the result of over-exertion, sexual excess, or other cause, is apt to leave the patient in a neurasthenic condition, of which the principal symptoms are dyspnœa and tremor on slight exertion or mental excitement, palpitation often entirely subjective, a more or less complete loss of self-confidence with reference to physical exertion, and a continual apprehension of death from cardiac failure. The patient may continue for weeks in a pitiable condition, afraid to raise his head from the pillow and dreading to fall asleep lest the heart should cease to beat. These cases are, in my experience, more frequent in men than in women, especially men who have been long subjected to the severe strain of active business life, or who have had an unusual load of sorrow or anxiety to bear. I believe that the uric acid diathesis is often largely concerned in the production of these symptoms.

No matter how skilfully the above-described condition may be treated, time is the most potent healer, I might almost say the only one. The cases seem to run a self-limited course which, at its shortest, is counted by months, and may last longer than a year. The affection is entirely mental, a form of hysteria, and, therefore, diversion, especially such as is obtained by travel, is of the greatest service. I knew a man suffering from this affection who walked slowly and with difficulty, leaning on the arm of a friend, to the water's side to witness a boat-race. At the beginning of the race he was listless and

languid, self-absorbed and furtively feeling his pulse. As the boats neared the finish and the excitement became intense, he was carried away by it, and forgetting all about his heart, he ran to the top of a small hillock to obtain a better view and was among the first to reach its summit.

The treatment of palpitation of the heart should be directed, first of all, to the removal of its cause. Manifest indications are furnished by chlorosis and anæmia, the abuse of tobacco, alcohol, tea, and coffee, and by the use of cocaine and morphine. The same is true of sexual excess and masturbation. It is a safe rule, in most cases, to prohibit absolutely the use of tobacco and alcohol and to enjoin great moderation in that of tea and coffee. A diet largely vegetable is the most appropriate. A saucer or two of oatmeal porridge or some wheat food, with a glass of milk and an egg, is an ample breakfast. At midday a mutton chop or its equivalent in some other meat is abundant in the way of animal food. In the evening, a glass of milk may again be taken, with bread and butter *ad libitum* and some apple-sauce or stewed fruit, dried or fresh. This may seem a somewhat spare diet, but in the lithæmic it will actually be found to be more strengthening than large quantities of butcher's meat, which chiefly serve to poison the system with the products of their indigestion. Among the remedies directed especially to the heart are the bromides, valerian, asafœtida, ammonia, sumbul, strychnine, digitalis, strophanthus, barium chloride, adonidine, *et id genus omne*. Arsenic as a general eutrophic may be continuously employed, and will be found particularly efficacious in combination with iron in the anæmic cases, and especially when there is pain in the region of the heart. Barium chloride, preferably given in pill form in doses of from $\frac{1}{10}$ to $\frac{1}{8}$ grain, is a good cardiac tonic and analgesic which I have employed with apparently good results.

In all cases of palpitation, but especially in those with an hysterical basis, the most important elements of cure are a thorough confidence on the part of the physician in his diagnosis and the consequent ability to assure the patient that his recovery is largely a question of time.

Essential Paroxysmal Tachycardia.—As implied by its name, this affection is characterized by rapid action of the heart occurring in paroxysms and without manifest cause. The onset of the paroxysm is sudden, without any apparent exciting cause, either mental or physical, the pulse suddenly running up to 150, 200, or even to 250 beats per minute, and it subsides as suddenly as it arose. Its duration may vary from a few minutes to many hours. This neurosis has been variously attributed to paresis of the vagus, to stimulation of the sympathetic, to both of these states combined, and, finally (by Mar-

tius), to an acute dilatation of the heart. Without attempting to discuss these different theories, which would be here out of place, I will merely say that the weight of opinion, as well as the facts, seems to me to favor the theory of paralysis of the pneumogastric. In explanation of this supposed paralysis, Kelly,[1] who reports four cases of the disease, suggests a retraction of the terminal filaments (dendrites and neuraxons) of the pneumogastric, and the consequent temporary withdrawal of its inhibitory influence.[2]

The disease does not necessarily interfere either with health or longevity. The most remarkable case of which I have knowledge is that reported by Professor H. C. Wood,[3] the patient being a distinguished physician of Pennsylvania who, after suffering from paroxysms of tachycardia in its most pronounced form for more than fifty years, died in 1896 at the age of ninety-two.

Various measures have been employed, more or less successfully, to arrest the paroxysm, chief among which are the rapid deglutition of a glass of ice-water or a number of small pieces of ice (a cup of hot tea or coffee is equally efficacious); holding the breath and straining, as in the act of defæcation; deep respirations; the application of an ice-bag or cold douche to the chest or abdomen; pressure on the vagus in the neck and electrical stimulation of the same region; and the induction of vomiting. Absolute rest in the recumbent posture should be enjoined. If the attack is protracted, a hypodermic injection of morphine may be administered. During the intervals between the paroxysms, the patient should lead a well-regulated life, avoiding excessive fatigue or undue exertion, either physical or mental; in short, paying the strictest attention to the laws of hygiene. Tobacco and alcoholic stimulants should be absolutely prohibited. If, during the attack, there are signs of dilatation of the heart, digitalis may be tentatively administered, but as a rule this and drugs of similar action are of little service.

Bradycardia.—An abnormally infrequent pulse is seen in a variety of pathological conditions, such as icterus, diseases of the digestive system, anæmia, diseases of the brain and medulla, and in poisoning from tobacco, alcohol, digitalis, and lead. It is most frequently seen during convalescence from acute infectious fevers. With our present knowledge, however, we must recognize a certain proportion of the cases as functional, inasmuch as they cannot be proved to depend upon an anatomical basis or a toxic agency. In the well-known case reported by Prentiss of Washington, in which the autopsy was per-

[1] "Essential Paroxysmal Tachycardia," by Aloysius O. J. Kelly, M. D., *Medical and Surgical Reporter*, Oct. 24, 1896.

[2] I refer those interested in the discussion of this etiological question to Kelly's interesting paper.

[3] *University Medical Magazine*, March, 1891.

formed by Robert T. Edes, the examination yielded practically negative results. In this case the pulse ranged from eleven per minute to forty per minute for over two years. Prentiss[1] gives abstracts from 94 cases, of which one had a pulse of four per minute for four consecutive minutes. The principal symptoms are attacks of syncope, epileptiform convulsions and delirium, which may be maniacal. As causes of the functional form of bradycardia we must assume an irritation of the pneumogastric, either direct or reflex, or diminished excitability of the ganglia of the heart.

The treatment is unsatisfactory, consisting chiefly of alcoholic stimulants, ammonia, camphor, strychnine, belladonna, and strong coffee, or caffeine. Prentiss's patient was apparently relieved by bromide of ammonium. The affection is not necessarily fatal; in other words, an abnormally slow pulse is not incompatible with health and vigor. Case LXXV. of Prentiss's collection, reported by Squire, was a man of eighty, whose pulse was ordinarily twenty-eight per minute, and who nevertheless was unusually vigorous, only showing signs of dyspnœa when going up-hill or making other physical exertion.

Angina Pectoris.—Two varieties of this affection are generally recognized: the one dependent upon organic disease of the blood-vessels in the immediate neighborhood of the heart, especially the coronary arteries, valvular disease, and diseases of the myocardium; the other having its starting-point in widespread vascular spasm. The latter is sometimes called pseudo-angina. Yeo[2] regards angina pectoris as "a neurosal incident of cardiac disease," and does not believe in a pseudo-angina dependent upon vascular spasm. In the graver forms, according to this authority, there is serious organic disease of the heart or blood-vessels, or both, while in the milder we have simply to do with a cardiac neuralgia or hyperæsthesia.

An attack of angina is sudden in onset and often without manifest exciting cause, occurring, for example, when the patient is lying quietly in bed, perhaps asleep. It is chiefly characterized by a sense of great oppression in the region of the heart, and excruciating pain which, through irradiation, may extend to other parts of the body, especially the left upper extremity. Dyspnœa is by no means a constant symptom, and the action of the heart is variously affected, being sometimes slow and arrhythmic, at other times rapid and irregular, while again it may not be appreciably disturbed.

There are the widest differences as to duration and recurrence of the paroxysms. An attack may last but a few minutes or may continue for hours. The first attack may be fatal, or the paroxysms may

[1] *Transactions of the Association of American Physicians*, vol. iv.

[2] *Practitioner*, May 1893.

recur daily for many weeks, while on the other hand there may be intervals of weeks or months between them.

As in all paroxysmal disorders, the treatment comprises the management of the attacks and the course to be pursued in the intervals between them.

At the moment of an attack the nitrites are to be resorted to and are generally effective. Yeo discusses the mode of action of these drugs and concludes that it is extremely doubtful whether the relief they afford is wholly due to their vaso-dilating action. Be this as it may, they are the most certain palliatives at our command. From 3 to 6 drops of nitrite of amyl should be poured on a handkerchief and held close to the patients' nostrils. If relief is not speedily obtained a tablet of $\frac{1}{100}$ grain of trinitrin should be dissolved in water and injected beneath the skin; or if this is thought unadvisable or objected to, a tablet ($2\frac{1}{2}$ grains) of nitrite of sodium may be given by the mouth and repeated every hour until three or four have been taken. In addition, diffusible stimulants, such as Hoffman's anodyne, sulphuric or nitrous ether, or the aromatic spirit of ammonia, may be administered. The hypodermic injection of morphine and the inhalation of chloroform may be resorted to in the severest cases, but are rarely necessary. Locally, hot mustard poultices (*i. e.* mustard stirred up with flaxseed meal) are of decided service.

In the intervals between the attacks, careful attention should be paid to the diet, which should be light and nourishing, and digestion promoted by vegetable bitters, such as quassia, gentian, and calumba. If the patient is gouty, butcher's meat should be reduced to a minimum or refrained from altogether, its place being supplied by milk, eggs, and fish. Tobacco, alcohol, tea, and coffee should be prohibited.

Elimination is considered of the utmost importance by Ord, so much so as to lead him to state that if he were restricted to one remedy in the treatment of angina, he would prefer sulphate of magnesium to nitroglycerin. In anæmic cases iron and arsenic should be prescribed, and even in those who are not anæmic arsenic is one of the best remedies. Another valuable drug in the intervals is the iodide of potassium, which may be given, with arsenic, in daily doses of 15 to 45 grains. The iodide is particularly serviceable when there are signs of degenerative changes in the blood-vessels. In my own experience, I have derived the greatest benefit from a drug of which I find little or no mention by writers on the subject of angina. I refer to aconite. In a case under my care at the Philadelphia Hospital, in which the paroxysms were of daily recurrence and frightful severity, complete relief was obtained from the tincture of aconite in doses of two drops every three hours. After several weeks of freedom from the attacks, the drug was stopped and they returned, only to disappear promptly on

the renewal of the treatment. The case was one presenting marked signs of aortic stenosis and insufficiency with considerable hypertrophy and dilatation. From my experience with aconite in true angina, I feel almost inclined to paraphase the statement of Ord by saying that if I were limited to one drug in its treatment I would select aconite.

HEART DISEASE AND PREGNANCY.

In connection with heart disease the question of sex is of the utmost importance. Other things being equal, the power of compensating valvular defects is doubtless as great in the female as in the male, but the supervention of pregnancy places the female at a disadvantage which is always serious and sometimes fatal. Even in the healthy female during pregnancy the reserve power of the heart is called into action. The total mass of blood is increased and respiration is interfered with by the pressure of the gravid uterus. To meet the extra demands upon the heart there ensues a physiological eccentric hypertrophy of the left ventricle. It is manifest, therefore, that a heart already crippled may become entirely incompetent during gestation. There is no medical question of greater practical importance than that of the relation between heart disease and pregnancy, and it has been carefully studied by some of the ablest clinicians. The conclusions at which they have arrived are, however, of little use to the practitioner unless he accepts the aphorism of Peter which forbids the maiden with heart disease to marry, the wife to conceive, the mother to nurse her infant.[1] Such a rule is too absolute, for there are undoubtedly cases of valvular disease, manifesting themselves by a distinct murmur, in which the heart is not only perfectly competent, but possesses sufficient reserve power to meet the demands of gestation. The writer, during his connection with the Woman's Hospital of Philadelphia as consulting physician, has seen a number of such cases, and is firmly of the opinion that valvular disease *per se* is no bar to marriage. At the same time, in unsuitable cases, he has not hesitated to "forbid the banns."

With reference to the question of the marriage of women with valvular disease, each case must be separately studied, and the intelligent family physician who has known the candidate for years and attended her in intercurrent attacks of illness is more capable of reaching a wise decision than the consultant who examines her but once or twice. I recently examined a woman thirty-four years of age who, for many years, has taught the art of dancing, not only by precept but by the most active kind of example, and had no difficulty in detecting a distinct aortic regurgitant murmur which had its origin in

[1] "Fille, pas de mariage; femme, pas de grossesse; mère, pas d'allaitement."

an acute rheumatic endocarditis from which she suffered some sixteen years previously. In this case, there is perfect compensation and but little hypertrophy. The regurgitation, although sufficient to give rise to a distinct diastolic murmur, is undoubtedly trivial and the woman might safely be permitted to marry. Fortunately for the physician he is relieved of a great deal of responsibility in cases of the kind under discussion, for his advice, if unpalatable, is almost certain to be neglected.

In deciding the question of the marriage of a woman with valvular heart disease her previous history as well as her present condition must be carefully considered. If the heart has shown signs of incompetence during attacks of bronchial catarrh or other ailments which are regarded as trivial by the healthy, it is not likely to withstand the strain of pregnancy. The social condition of the patient is also an important factor. A woman who is able to spend the latter months of gestation in a state of mental and bodily repose is manifestly more likely to pass the ordeal of parturition than one who is compelled to occupy herself with the duties of housekeeping. If, at any time, the patient has presented such signs of incompetence as marked dyspnœa on slight exertion, hæmoptysis, albuminuria, or œdema, the physician should positively refuse to sanction her marriage.

In the foregoing remarks no attempt has been made to discriminate between the various forms of valvular disease in their relations to gestation and parturition, and it is doubtful whether it is possible to do so with accuracy. The question is chiefly one of compensation, and this may be more or less perfect in each variety. Statistics, it is true, seem to demonstrate that mitral stenosis is the gravest cardiac complication of pregnancy, but this may be due to the remarkable frequency of this lesion in females. Of 62 cases analyzed by Herman Allyn,[1] 23 died and 37 recovered; in 2 the result was uncertain. "In the number of deaths are included all who died during pregnancy, at confinement, or within three weeks afterwards." Porak gives the mortality of 22 cases of mital insufficiency as 13.66 per cent., and that of 13 cases presenting aortic lesions as 23.07 per cent.[2] Larger figures might alter these results materially, but the question, I repeat, is one of compensation rather than of any particular lesion.

In the treatment of failing cardiac compensation in the pregnant woman, the same measures are applicable as in cardiac asystole in general. If these fail to restore the vascular equilibrium the question of inducing premature labor should be considered, and, pending its settlement, venesection should be practised. No definite rules as to the amount of blood to be withdrawn can be formulated. The object in

[1] *University Medical Magazine*, April, 1894.

[2] Quoted from Allyn, *University Medical Magazine*, December, 1895.

view is the relief of the laboring heart, and the best criterion of such relief is afforded by the respiration, which, from being difficult, oppressed, and shallow, becomes easy, tranquil, and deep. In one case the desired effect may be obtained by a venesection of six ounces, while in another twenty ounces may have to be withdrawn.

As regards the induction of premature labor, it may be stated, in general terms, that this procedure is most applicable in the early months of gestation. If serious symptoms appear before the sixth month it is evident that the gestation cannot proceed to term without the gravest danger to the mother, whereas, on the other hand, if they do not supervene until the seventh or eighth month, it may be expected that, under vigorous treatment, including venesection, the full period of pregnancy may be accomplished.

DISEASES OF THE BLOOD.

By RALPH STOCKMAN, M. D., F. R. C. P. Edin.

The subject of Diseases of the Blood has been so ably and exhaustively treated by Dr. Shattuck in an earlier volume of this System, that in a supplementary article such as the present, written within four years of the original publication, little new is to be said on most points. The broad clinical features of the different morbid conditions have been long clearly laid down and for the most part receive general acceptance, while the grosser and more easily recognized pathological changes in the blood and other organs have been described with accuracy and detail. It is when we come to deal with the finer pathology, and more especially with the etiology, of those diseases that our knowledge is found to be disappointingly vague and meagre, and in many if not in most of them it gives us few or even no indications for satisfactory treatment. In fact, our treatment of most of these conditions is still in the empirical and experimental stages.

During the past few years our knowledge has undoubtedly been considerably extended by a number of clinical and experimental observations, yet these have dealt chiefly with details, and for the most part do not represent any very striking or radical advances.

It is perhaps desirable to say here a word about the present classification of the so-called "blood diseases." In this category authors have somewhat arbitrarily included many conditions which produce anæmia, but which manifestly only affect the blood as a secondary consequence of the original disease, while diseases involving the lymphatic glands and other parts of the hæmatopoietic system are also generally described under this heading. It is plain that many of the conditions, such as melanæmia for instance, are clearly dependent on malaria or other disease, and that treatment directed solely to improve the blood will be quite inadequate until the *origo et fons mali* has been successfully dealt with. In the same way Addison's disease has been gathered into the list of diseases of the blood, although we have no authority for doing so from our scanty knowledge of the purposes which the suprarenal bodies subserve in the animal economy. Further, it is at present the custom for systematic writers to divide anæmias into two classes—primary or idiopathic, and secondary—and

this is admittedly to a certain extent a convenient clinical distinction, but it is doubtful if it is a scientifically accurate one. We know definitely that anæmia follows cancer, phthisis, lead-poisoning, hæmorrhage, etc., but we do not know definitely if in any single class of anæmias the blood is the seat of primary affection. In fact, as our knowledge advances and their causes become revealed, the so-called primary anæmias are gradually disappearing. It is certainly a misnomer to call such cases idiopathic, and if we use this term at all we should feel quite clearly that as yet we have simply failed to recognize the cause, and not that no cause for the condition exists.

The outcome of these considerations clearly is that the term "diseases of the blood" is rather a convenient designation than a scientific classification, and that it is at present made to include a somewhat heterogeneous collection of morbid conditions, some of which are very ill understood. But while admitting that the generally accepted classification is unsatisfactory, yet it would be premature and useless to attempt to classify these diseases more accurately until our knowledge has been considerably extended. It would probably be best provisionally to designate them as "diseases affecting the hæmatopoietic system," which does not tie one down to any theory and is sufficiently comprehensive to include not only all the elements of the blood itself, but also the glands and tissues which are more directly concerned in its manufacture and maintenance in a healthy condition.

CHLOROSIS.

In all cases of chlorotic anæmia the amount of hæmoglobin and therefore of iron in the red blood-corpuscles is seriously diminished. It may even reach as low as 20 per cent. on Gowers' hæmoglobinometer scale, but such a diminution is decidedly rare, from 30 to 50 per cent. being much more commonly found. The red corpuscles may be normal in number, but any number down to two millions per cubic millimetre as recognized by the hæmacytometer is not unusual. The following table shows the results which I obtained from the examination of 61 cases, all occurring in young women:

Number of patients.	Number of red corpuscles per c.mm.	Range of Hb.	Average of Hb per case.
6	4½ to 5 millions.	46–66 per cent.	52.6 per cent.
9	4 to 4½ "	30–60 "	44.8 "
11	3½ to 4 "	35–54 "	42.7 "
15	3 to 3½ "	22–44 "	33.2 "
10	2½ to 3 "	30–48 "	35.7 "
8	2 to 2½ "	20–46 "	31.6 "
2	1½ to 2 "	25–28 "	26.5 "

The alterations in form of the corpuscles are usually, but not always, slight, and the blood-serum is not at all deteriorated either as regards its solid or liquid constituents.

This condition of the blood cannot be regarded, however, as absolutely distinctive of chlorosis, seeing that it is found in other forms of anæmia and notably during recovery from hæmorrhage. Indeed, one cannot say definitely that any one clinical feature is pathognomonic of chlorosis, but when we find blood-changes of this character occurring in young women who still remain plump, and yet suffer from pallor, and from more or less marked cardiac, digestive, and menstrual disturbances, the whole forms a distinctly outstanding clinical picture which is one of the most familiar to physicians.

Etiology.—The etiology of chlorosis is so closely bound up with its successful treatment that a somewhat full consideration of this may not be out of place. It is now generally admitted that chlorotic anæmia does not arise from excessive destruction of red corpuscles, but is due to deficient formation or to actual loss of blood. Sir Andrew Clark and others have held that dyspepsia, and especially constipation, give rise to ptomaïnes in the intestinal canal, which, becoming absorbed, break down the blood-corpuscles. But, apart from the fact that many chloroties do not suffer especially from constipation, the pale color of the urine and fæces indicate that fewer red corpuscles are being disintegrated than in healthy persons, while exact researches have demonstrated the absence of any special sepsis in the alimentary canal. Many other causes have been blamed, such as absence of light and fresh air, overwork, especially under bad hygienic conditions, all kinds of depressing and unhealthy emotions, indigestion, excessive or otherwise faulty menstruation, tight-lacing, etc. Most of these, however, must be regarded as predisposing rather than direct causes, and, as the result of the investigation of a large number of cases, I have come to the conclusion that the *direct* causes of chlorosis may be reduced to two, namely, insufficient supply of iron in the food, and loss of iron from the body by menstrual or other bleeding. Without doubt the onset of puberty and the consequent strain thereafter thrown on the body for some years by its rapid growth and development are powerful factors in determining the deleterious effect of these influences on the red blood-corpuscles. A certain number of cases undoubtedly are met with in which there has never been any unusual menstrual loss and in which the amount of food taken is satisfactory, but in these even normal conditions probably overstrain the rapidly growing organism.

Lloyd Jones holds that the changes in the blood seen in chlorosis are simply an exaggeration of what normally occurs at puberty in girls, at which time, he says, the specific gravity of the whole blood

falls, the fall being especially due to deficiency in hæmoglobin. These changes do not occur, he states, in the blood of boys, and hence their immunity from anæmia at an age when it tends specially to affect the other sex. He fails to explain, however, why this normal physiological process should go on to a pathological extent in some cases and not in others, and why chlorotic anæmia should often occur later in life.

Dr. Frederick Taylor has justly remarked that for any theory of the cause of chlorosis to be satisfactory, it must take into consideration and account for its overwhelming preponderance in the female sex and at or about the age of puberty. It seems to me that the following considerations fulfil the conditions: In women, and especially in young women, the number of red blood-corpuscles and the amount of hæmoglobin is considerably less than in men, and therefore the blood is less able to bear any extra strain thrown upon it. That such a strain occurs at puberty there can be no doubt, for not only the blood but the whole organism suffers in its nutrition at this epoch. Primary digestion is usually much interfered with, constipation is common and often very severe, while surprisingly little food is consumed in many cases, and all this while the girl is growing fast. From analyses of the daily dietaries of healthy men and women I have found that the amount of iron ingested equals on an average 8 to 10 milligrammes (about $\frac{1}{8}$ to $\frac{1}{6}$ of a grain) per day, while the analyses of five days' food of three chlorotic girls showed that they were ingesting only from 3.2 down to 1.2 milligrammes (about $\frac{1}{20}$ to $\frac{1}{50}$ of a grain) of iron per day. It has never been determined how much iron chlorotic women excrete by the bowel and kidneys, but healthy persons lose by these channels at least about 6 milligrammes daily. It is, therefore, at once apparent that with a loss of iron from the body which at all approaches the normal, and with such an insufficient intake, the result will be that the organism gradually becomes drained of its iron and there remains little or none from which new hæmoglobin can be formed. Of course in these cases the food will always supply a certain amount, but this is obviously too little to maintain the hæmoglobin at a healthy level.

That by menstruation a relatively large amount of iron may be lost is also made obvious by a very simple calculation: In 100 grammes of healthy blood there are about 45 milligrammes of iron. Now, during a menstrual period, say about six ounces of blood are lost; this means about 90 milligrammes of iron—that is, as much iron as a healthy person ingests in food during nine or ten days. In healthy women there are reserves of iron in the liver and spleen which can be at once drawn on to supply this demand, and hence the loss is easily borne and soon made up, but the anæmic have no such

reserves, and thus each period increases their lack of iron and hæmoglobin. It is certain, therefore, that loss of blood not only directly produces anæmia, but also prevents speedy recovery from it by draining off the reserves of iron in the body. As a corollary the amenorrhœa of chlorosis must be regarded as protective and beneficial, and as a result, not a cause, of the anæmia.

To summarize: All the causes of chlorosis, ordinarily enumerated, may probably be reduced to two *direct* causes:

(1) *Excessive menstrual loss*, or (much less frequently) other blood-loss. This may be relative, that is, too much for a weakly or rapidly growing organism to bear, or it may be actually large.

(2) *Insufficient ingestion of iron* with the food. Anything which diminishes the appetite diminishes the consumption of iron; therefore dyspepsia, constipation, unhealthy surroundings, mental depression, etc., all predispose to anæmia by lessening the amount of food consumed. In many cases both causes are combined. The anæmia of boys and of non-menstruating girls can be explained in this manner also.

Treatment of Chlorosis.

Administration of Iron.—Clinical experience has proven abundantly that the chief remedial measure in chlorosis is the administration of iron. Any one of the ordinarily used preparations suffices, as they can all be absorbed, and in the present state of our knowledge no one preparation can be definitely put before another merely as regards iron.

The state of the stomach, therefore, must be our chief consideration in choosing the form of iron to be used in any particular case. If, as so often happens, there is gastric irritability, the mildest and least astringent preparations do best, such as reduced iron, ferrous carbonate in one form or another, or one of the double salts, while the oxalate and lactate are also suitable. The protochloride and sulphate, although very largely used, are more irritating, and the ferric salts are both more irritating and more astringent than any of the others. Large doses are generally held to act more rapidly and efficiently than small, but in my opinion too much has been made of this, and, further, they tend to seriously disarrange digestion. No doubt, if a very large quantity of iron is present in the alimentary canal, the probabilities are that rather more of it is absorbed than if the quantity were small, but this is more than counterbalanced by the attending disturbances of primary digestion. I generally give one grain of reduced iron made into a pill with a small amount of extract of gentian thrice daily after food, and I find that it is invariably well borne by the stomach, does not tend to cause constipation, and acts

quite as quickly and efficiently as much larger doses. Two grains twice daily after meals is just as efficient and lessens the number of times of taking medicine.

There has been much discussion as to the mode of action of iron, some authorities holding that none of the metal is absorbed, and that it simply stimulates gastro-intestinal digestion so that more food is consumed and the iron of the blood is made up from the organically combined iron contained in our dietary. Bunge and others believe that iron in the bowel simply prevents the sulphides there present from separating out the iron of the food and thereby rendering it unabsorbable; but I have shown that sulphide of iron is as efficient in curing chlorosis as other iron preparations are, while bismuth and manganese, which are just as capable of absorbing sulphuretted hydrogen as iron is, have no curative effect. If Bunge's theory were correct, these and other drugs should act quite as beneficially as iron undoubtedly does, but they do not. Macallum has now actually traced in animals the absorption of inorganic iron salts by the mucous membrane of the bowel, and this should for ever set the question at rest. We have no knowledge of the amount actually absorbed from the human intestinal canal when iron is given medicinally, but even under the most advantageous circumstances it is always small, and probably does not exceed some milligrammes per day. After absorption it seems to be stored up in the liver and to be converted into organic compounds resembling hæmoglobin in constitution, but more simple, and these ultimately form the hæmoglobin of the red blood-corpuscles. The amount thus stored in the liver I found in healthy organs to vary from 0.182 to 0.310 gramme (about $2\frac{7}{10}$ to $4\frac{3}{5}$ grains) metallic iron, and as Bunge reckons the total iron present in the body of an adult at 2.5 grammes (38 grains), the liver is seen to contain a not inconsiderable proportion of the whole. The iron of the liver is, however, a very varying quantity.

From a practical point of view it seems hardly necessary to say much about the hypodermic administration of iron, as the cases are very few in which the drug cannot be tolerated by the stomach, and the results of subcutaneous medication are in no way superior to the commoner method. Rosenthal, Luton, Da Costa, and many others have reported cases of successful treatment. I myself have treated four patients in this way, administering once daily a dose of the citrate of iron and sodium equal to $\frac{1}{4}$ or $\frac{1}{2}$ grain of metallic iron. Recovery took place in a perfectly satisfactory manner, but not more quickly than when larger doses are given by the stomach. Solution of ferrous citrate, various so-called peptonates and albuminates of iron, solution of dialyzed iron or other preparations have all been given in this way, but no preparation thoroughly satisfactory for

hypodermic use has yet been proposed.[1] Whatever solution is used ought to be perfectly neutral, as little astringent as possible, and should be injected into the deep tissues of the back. If these precautions be taken no pain or discomfort results, but not more than ½ grain metallic iron should be given at a dose.

Iron can also be given with success *per rectum*. The best preparation is a thoroughly neutral and unirritating combination with albumin, and this may be given in large doses.

Hæmol and *hæmogallol* are two preparations made from blood, which have been proposed by Professor Kobert as being very readily absorbed and utilized, but my clinical experience has been that they are almost useless. *Ferratin*, a preparation made from the liver and containing about 6 per cent. of iron, is a little better than these, but by no means equal to the ordinary inorganic compounds. These preparations contain too little iron to be of much value, and the same is true of the various wines and other similar products of pharmaceutical enterprise which are so much advertised.

Blood and various preparations made from it I have never found of much value, as they are difficult to digest and do not contain a sufficient quantity of iron.

Manganese, which has a certain reputation as a hæmatinic, I have found to be absolutely useless in chlorosis. I am inclined also to the opinion that arsenic is of little or no value in chlorotic anæmia, although its effect in the anæmia of tubercle and in other forms is beyond dispute. In cases of chlorosis which I have treated with arsenic alone no improvement of the blood ever took place, but recovery immediately began whenever iron was substituted. This has been the experience of other observers also. The fact remains, however, that small doses of arsenic are very largely used as an adjunct to iron, and there is a very general belief that it stimulates blood-formation and hastens recovery.

As regards dietetic measures the greatest care should be taken to improve appetite and digestion. Good general surroundings and personal hygiene, along with the treatment of the ever-present dyspepsia or constipation, are of the utmost importance, as thereby the patient gets into the habit of taking large quantities of food and hence ingests sufficient iron. The same is true of country air, spa treatment, hydrotherapy, and massage, all of which are useful adjuncts to the more direct methods of cure. No specific dietetic rules can be laid down applicable to all cases, for the diet must be entirely regulated by the condition of the digestive organs. If gastric digestion is good, then an ordinary mixed diet is most suitable, and it can be modified to suit cases which suffer from constipation. If there be severe dyspepsia or

[1] For full information on this subject see J. M. Da Costa, *Therapeutic Gazette*, May, 1896.

gastric ulcer it is obvious that a dietary appropriate to these conditions must be prescribed. In all cases, however, iron must be given —for, once a patient is markedly anæmic, the amount of iron furnished even by an abundant dietary can only go a very little way toward providing the supply of that metal necessary for recovery. Say that the blood is deficient in iron to the extent of fifteen grains, it is evident that it will be a very long time before this can be made good from the small amount of surplus iron in an ordinary dietary.

Rest in bed is justly held to be an important element for the successful treatment of severer cases of chlorosis. Many patients do best if confined strictly to bed during the first fortnight of treatment, and some recover only after this has been strictly attended to. The most probable explanation seems to be that during complete rest the demand for oxygen is much less, and hence the diminished hæmoglobin can cope with it. The muscles at rest use very little, and hence the supply can be employed almost exclusively for purposes of nutrition, and thereby digestion and general health are improved. Slight cases of chlorosis, however, do best with an open-air life and a moderate amount of exercise. Violent exertion of all kinds should be strictly prohibited, as the strain thrown on the heart is apt to lead to dilatation.

Once the patient is fairly under treatment with iron and other measures there is a rapid improvement in the blood. The corpuscles, if deficient, generally reach the normal standard in about a fortnight or less, but the hæmoglobin lags far behind, and it takes usually four to six or eight weeks before its maximum is reached.

The value of treatment by purgatives requires perhaps more than a passing reference, seeing that the theory on which it is based has attracted much attention in our profession. In 1805, Hamilton of Edinburgh, conceiving that chlorosis was due to malnutrition consequent on constipation, proposed to use purgatives very largely in its treatment, but a perusal of his work does not convey the impression that he had any very striking success. In 1887, Sir Andrew Clark again brought forward this plan, founded on the theory that the anæmia is due to absorption of decomposition-products from the bowel. He used saline purgatives, but the mixtures which he prescribed contained very large amounts of iron, and hence no conclusions can be drawn from his observations. Besides this, the theory of the etiology of the disease on which his treatment was founded has since been proved erroneous. Further, observations have now been made on many cases which were treated by purgatives alone, and the unanimous verdict of many clinicians is that purgation *per se* has no direct effect in curing the anæmic condition. No one, however, denies its value as a means of general treatment in this as in many

other conditions where constipation is often a prominent feature. As regards massage exact observations have been made by J. K. Mitchell, who found that in all forms and grades of anæmia improvement took place in the number of red corpuscles. It was at first transient, but after repeated rubbings for an hour daily becomes permanent. There is a less marked and less constant increase in the hæmoglobin-value. The general toning up of the muscles and circulation tends also to promote recovery.

Many cases show a tendency to relapse, and hence prophylactic measures assume great importance. Seeing that undue menstrual losses and insufficient food are the two great immediate causes of chlorosis, prevention seems simple enough. If the patient be not placed under favorable conditions or remain subject to the causes which originally produced the anæmia, then treatment may be inefficacious or very prolonged. Therefore if the menstruation be relatively or absolutely too abundant, it should be diminished by giving ergot or by other measures. More important still is the cultivation, by exercise and all possible means, of an habitually good appetite and vigorous health, because thereby the blood is kept at a healthy standard.

SPLENIC ANÆMIA.

This is a little-known and ill-understood disease in which anæmia is a prominent symptom. According to Banti the deterioration of the blood is secondary to enlargement of the spleen; Kanthack regards the splenic hypertrophy as secondary and compensatory in character; while Von Limbeck has suggested that it is the last stage of the severe anæmia of syphilis or rickets. As a matter of fact our knowledge of clinical and pathological data bearing on the condition is as yet much too limited to enable us to come to any satisfactory conclusion as to its cause, but I have seen a case in which acquired syphilis, rickets, and malaria could with certainty be excluded from the patient's previous history. It has also been named "splenic cachexia," "splenic pseudo-leukæmia," "lymphadenoma splenica," and "primary enlargement of the spleen"—*splénomegalie primitive* of some French authors. The name splenic anæmia implies a theory as to the causation of the blood-changes, and is therefore not quite satisfactory, but it may be retained until improved knowledge gives us a right to name this state more appropriately.

This variety of anæmia occurs at all ages, but is apparently most frequent in male adults in early middle life, beginning with gradually increasing weakness and pain in the splenic region. The attacks of pain become more marked and more frequent, the spleen becomes greatly enlarged so as to cause a distinct swelling of the abdomen,

and there is pronounced anæmia. Extreme anæmia, great weakness, and death from exhaustion or hæmorrhage ultimately occur. The liver is usually enlarged to a moderate or considerable extent, there are attacks of perisplenitis often accompanied by very severe paroxysms of pain, and the temperature keeps up to about 102° or 103° F. There may be severe dyspepsia, sometimes with constipation, sometimes with profuse diarrhœa. The patient is sometimes cachectic, but may have a fairly well-nourished and healthy look, and may only complain of the "lump" in the left side. Hæmorrhages are common from the nose, stomach, bowel, and gums, and also occur into the retina, the spleen, and other viscera. The disease is generally progressive from bad to worse and runs its course in from one to four or five years.

The red blood-corpuscles may be diminished one-half or more, and the hæmoglobin falls in about an equal proportion; the red disks are not misshapen and there is no leucocytosis.

After death the fibrous trabeculæ of the spleen are seen to be much hypertrophied, there is atrophy of the Malpighian bodies, and the organ may weigh as much as six pounds. The liver has been found normal, but usually there is a large increase in its fibrous tissue and also in size and weight. As regards the amount of iron found in these organs different cases have yielded different results; in some no reaction to the ordinary tests for iron has been obtained, while in others there has been a decided increase, but no exact analytical estimations are recorded. Little also is known of the changes in the bone-marrow, but they, too, seem to be inconstant.

Banti thinks the condition may be a purely splenic form of pseudo-leukæmia (Hodgkin's disease), and that the spleen having become enlarged destroys the red corpuscles. This view, however, seems to be negatived by the fact that the iron arising from the destroyed corpuscles may be quite absent from the spleen and liver. Neither can the changes in the blood and nutrition be due to abolition of the functions of the spleen, as it is well known that men can live in good health after excision of that organ.

In a treatise dealing specially with the therapeutical aspects of disease some apology may be considered necessary for dwelling at such length on pathology and symptoms, but my excuse must be that the condition is at present little known to the profession generally, and that, when the attention of a wider circle has been drawn to it, advances in treatment may be confidently expected to follow.

Hitherto the results of treatment have been extremely disappointing. Arsenic, after a fair trial in a number of cases, has been almost unanimously pronounced to have practically no effect either in curing the disease or in arresting its course. The same is true of other drugs such as iron, quinine, ergot, and potassium iodide. Taylor, however,

states that he has seen temporary improvement follow on the simultaneous administration of arsenic, potassium iodide, and oxygen gas to the amount of 30 litres daily. Splenectomy seems to offer the best chance of saving the patient. In several cases the patient has survived excision of an enlarged spleen, but owing to the disease being little known and to meagreness of description it is difficult to judge if these were real cases of splenic anæmia. Further, it is often difficult to gather from the published accounts how long the patient lived after recovery from the operation, and this is a matter of great importance in judging of the ultimate value of the operation, as splenic anæmia is often a very chronic disease and the patient might have lived just as long without undergoing operation.

Spanton has collected 38 cases of "hypertrophy" of the spleen in which splenectomy was performed. Of these 18 recovered, but it is impossible to say whether they were all cases of splenic anæmia.

PERNICIOUS ANÆMIA.

A SATISFACTORY consideration of the therapeutics of pernicious anæmia is rendered very difficult by the complete absence of agreement as to what really constitutes the disease. As regards the clinical features there can be no dispute, as the excessive anæmia, the yellowish tinge of the skin, the extreme muscular and cardiac debility, the dyspepsia, and irregular febrile attacks with the tendency to hæmorrhages, enable one to diagnose the case almost at a glance. The hæmoglobin may be reduced to 10 per cent. and the red blood-corpuscles to 500,000 per cubic millimetre, but they are usually about double these numbers when the patient first applies for advice. There are marked alterations in the shape of the red disks, and there may be many microcytes and a few nucleated red cells. Great stress is usually put on the fact that the red corpuscles are diminished proportionately to the hæmoglobin, and this is often laid down as an essential point of difference between chlorosis and pernicious anæmia. I am inclined to think, however, that too much importance has been attached to it, and that this proportion is present in all cases of very severe anæmia from whatever cause.

Clinicians are now agreed that this profound degree of anæmia may be brought on by many conditions, and hence many hold that it is not a disease by itself, "a morbid entity," but is simply an extreme deterioration of the blood following on any one of numerous and varied preceding states. Certainly, whatever be the cause, or whether no definite cause be found, the symptoms are practically identical in all cases. Cases have been reported in which it has followed an atrophy of the gastric mucous membrane, ulceration of the intestinal canal, diarrhœa, severe hæmorrhage, pregnancy, lactation, typhoid and other

fevers, malaria, syphilis, chlorosis, and jaundice. Typical examples have been described where, post-mortem, malignant disease of the abdominal viscera or of the bones was present, and it is now established that the clinical features of so-called pernicious anæmia may be reproduced in every detail by intestinal worms such as the *Bothriocephalus latus* and *Anchylostoma duodenale*. The latter certainly induces the anæmia by direct withdrawal of blood, and hence acts like hæmorrhage, but how the former impoverishes the blood and why it only does so in certain cases is quite unknown.

On the other hand, many physicians have a totally different conception of what should be understood by the term pernicious anæmia, and hold that true cases are not secondary to other conditions. Dr. Pye-Smith insists that cases of extreme anæmia after pregnancy, diarrhœa, hæmorrhage, etc., are not true cases of the "idiopathic anæmia of Addison" where no cause is discoverable; and Dr. Hale White says: "For the case to be an example of the disease described by Addison it is essential that there should not be present any of the usual causes or concomitants of the anæmic state." They wish, in fact, to call "pernicious" or "idiopathic" anæmia only those cases in which we are ignorant of the cause, assuming that in these it is a primary blood-disease, and ignoring the fact that no disease can properly speaking be called idiopathic. Such a term simply implies that we do not know the cause, and since Addison's time we have discovered the cause in many cases which he might have classed as idiopathic.

Dr. W. Hunter has advanced a theory which has obtained wide support. He holds that pernicious anæmia is a distinct disease due to excessive blood-destruction, and that its most constant pathological feature is a large excess of iron in the liver, which distinguishes it from all other varieties of anæmia. He believes that the red blood-corpuscles are broken down by decomposition-products formed in the alimentary canal and absorbed into the portal circulation, the excess of iron in the liver being derived from the débris. Lépine holds a position somewhere between the two extremes in believing that the condition follows on causes generally recognized as predisposing to anæmia, but that there is superadded an individual weakness in blood-forming power which determines the great extent to which it progresses. Eichhorst, on the other hand, holds the opinion that some cases are "primary," "idiopathic," or "essential," and others secondary to exhausting conditions or diseases.

From the present evidence it seems most probable that pernicious anæmia usually follows loss of blood or well-recognized debilitating causes of one kind or another. The cause is, however, in many cases undetected, but these can hardly be regarded as idiopathic in origin. Further, it is improbable that a hypothetical wholesale de-

struction of red blood-corpuscles by the liver-cells or by a ptomaïne or ferment is the cause of the condition. Debilitating conditions are common enough, yet they are comparatively seldom followed by extreme anæmia, and we are as yet, in a broad sense, quite ignorant of the reasons for its occurrence in certain cases. In all cases it is the intense bloodlessness which is the cardinal feature of the disease clinically. The debility, breathlessness, yellow color of the skin, and excess of iron in the liver are of secondary import. In fact, I have shown that many cases of fatal anæmia present no excess of iron in the liver or spleen, and that in cases where iron pigment exists in large amount in these organs it may also be found in the brain, kidney, fatty tissue, etc., which can hardly be supposed to have any blood-destroying function. Whether this iron pigment arises from the hæmoglobin of internal hæmorrhages, or from red corpuscles which have been actively destroyed somewhere in the body is still in dispute.

Treatment.—Seeing that so many widely different causes may give rise to extreme and frequently fatal anæmia, our first endeavor should be to treat any case on etiological principles. Unfortunately this is only sometimes possible, as the causes underlying the anæmia are often discoverable only after death, or are not revealed even by the autopsy. To this ignorance is no doubt attributable in some degree at least the frequent non-success of treatment, while in addition many cases apply for advice only when they have reached a high degree of bloodlessness and when the extreme debility, gastric dyspepsia, and liability to diarrhœa stand greatly in the way of successful treatment. Although Habershon says that many patients in the early stage recover under iron and general tonic treatment, yet experience forces us to admit that in the ordinary run of cases the prognosis is extremely grave. Reliable statistics as to permanent cures are lacking, but Quincke reports 7 cures out of 21 cases, Müller 3 out of 44, and Pye-Smith 20 out of 110. Many of these so-called cures were certainly not permanent, as hospital cases especially are apt to drift out of ken and die without any information being communicated to their doctor. It is a common enough experience to have a case which recovers for some months or even for a year or two and then relapses and dies ; in fact, some few go on in this way for many years. It is known, however, that a few cases have made permanent recoveries, and if we include those cases due to intestinal parasites the number grows very considerably.

Cases secondary to malignant disease, to chronic gastric atrophy, or other necessarily fatal conditions may be dismissed at once as hopeless. Specific lines of treatment cannot be laid down for these : the patients must be treated on general principles, and the symptoms as they arise ameliorated as far as possible. Bitters and acids may be

given to assist digestion, while strict attention to the dietary and the administration of moderate quantities of wine certainly add greatly to the patient's comfort.

Wherever hæmorrhages from piles or from mucous surfaces are present these must be carefully and at once controlled, and so must diarrhœa, which seems to be specially exhausting and often precipitates the fatal termination. The diarrhœa is often most obstinate, but the best means of stopping it consist in putting the patient on a diet of boiled or peptonized milk, in giving opiates by the mouth, and starch enemata. Fifteen minims of laudanum and liquid extract of ergot every six hours often succeeds well, but, failing this, large doses of subnitrate of bismuth, solution of per-salts of iron, or other astringent measures may be tried. A history of syphilis or malaria may give us some guidance, but Müller's results with anti-syphilitic treatment are certainly not very encouraging: out of four only one case recovered.

In the anæmia of ankylostomiasis anthelmintic treatment is usually successful. This disease is endemic in Egypt and India, where it is answerable for a very large amount of chronic ill-health, and it has been carried to the Cape, Fiji, Trinidad, and other places by immigrant coolies. Several outbreaks have occurred in Germany, France, and Austria among miners, and in Switzerland and Italy among the navvies engaged in railway-tunnelling. The eggs of the parasite are found in the soil and are swallowed with food. The eggs are present in large numbers in the fæces and are easily recognized under a low power of the microscope, so that diagnosis is easy. The best treatment is by thymol, of which 20 grains dissolved in brandy or other spirit may be given once or oftener. Filix mas may also be used in appropriate doses—one or two drachms of the liquid extract in emulsion. Where the habits and surroundings of the patients are good they almost invariably recover under this treatment, but in coolies, who are filthy in their habits and are often dirt-eaters, deaths are not infrequent. Thus in Fiji, Hirsch reports 26 deaths out of 126 cases treated.

Bothriocephalus anæmia is most common on the shores of the Baltic, but it is probable that other kinds of tape-worm may give rise to fatal anæmia. Formerly all these cases died in spite of arsenic, iron, and other drugs, but now, when the causal connection between the parasite and the anæmia has been recognized deaths are rare, and this should lead us to hope that many other kinds of cases would be equally amenable to treatment if we only knew the cause. Filix mas readily kills the worm, and as soon as the latter is expelled recovery begins, and is usually complete in about six weeks.

Hunter, basing his treatment on the theory of intestinal sepsis, has advocated the use of a farinaceous diet with intestinal antiseptics

such as beta-naphthol, but I must confess that I have never seen much success follow this plan, although mercurials, guaiacol carbonate, and numerous other drugs of the same kind have been used in addition. Nevertheless, Sandoz reports a case due to excessive fermentation in the stomach and intestine, which was cured by persistent lavage, while Jürgensen states that a patient of his recovered after the expulsion of enormous numbers of *Bacterium termo* from the bowel. Cases which have been brought on by hæmorrhages, hardships, poor feeding, or by unknown causes are best treated by careful and nourishing feeding and by arsenic and iron. Arsenic is the drug on which experience has taught us to place most reliance. Its mode of action is not understood, but the most probable explanation is that it stimulates the formation of new corpuscles by the red bone-marrow. It has undoubtedly started many cases toward recovery, although too frequently this is not permanent, and disappointing relapses follow. It is usually given in 5-minim doses of Fowler's solution thrice daily after food, but of course the dose may be varied to suit the case. Iron does not usually make any marked improvement in the blood, and fails to cure or improve the patient's condition. In fact, the failure of iron to effect a cure has often been included in the definition of pernicious anæmia, but we should remember that iron is equally ineffective in the anæmia of such constitutional diseases as cancer and tubercle, and that where it fails it probably does so by not affecting the underlying cause. It is good practice to combine it with arsenic, because if the arsenic increases the formation of red blood-corpuscles it is necessary to supply sufficient iron to provide the necessary hæmoglobin.

Iron given alone, however, has often proved successful, and hence the general pessimistic view of its inutility is probably too extreme. Thus Quincke treated his seven cases of recovery with iron, and cases have been recorded in which arsenic failed to effect any improvement, but in which recovery subsequently took place under iron. It is sometimes very badly borne by the stomach, and in these cases may be given *per rectum*. Administration by subcutaneous injection has not proved more successful than by the mouth.

Phosphorus has been recommended, and occasionally seems to improve the condition of the blood, but on the whole its use has been disappointing.

Bone-marrow was first used by Dr. Dixon Mann,[1] who gave a glycerin extract in three cases of anæmia with asserted good results. Subsequently it was stated by Fraser to have cured a case of pernicious anæmia which had made no improvement under iron, arsenic, and salol, but immediately began to recover when three ounces of ox

[1] *Lancet*, 1894, i. 599.

and calf bone-marrow daily were added to the treatment. Barrs has also published a case in which arsenic had failed to effect any improvement, and in which he then administered bone-marrow without any other drug, when complete recovery took place in about two months. Since then several other cases have been reported in which bone-marrow has done good, as well as others in which it has been without effect, and as yet no definite opinion can be expressed regarding its real value. Whether it be red bone-marrow or yellow, it contains mere traces of iron, and in the latter case consists almost solely of fat. It may, however, possibly contain some active chemical principle which is of advantage in blood-formation, and the fact that glycerin extract is reported to be as efficacious as the marrow itself would, if it be true, lend support to the view. Further clinical and experimental observation is required to settle this question.

Transfusion of blood has very frequently been resorted to with the view of supplying the deficiency of blood-corpuscles. Only the blood of man should be used, as that of other animals is deleterious in many ways. Four to six ounces of blood should be withdrawn from the donor and rapidly mixed with one-third of its bulk of solution of phosphate of sodium made up to the specific gravity of blood-serum (about 1028) and kept at the temperature of blood in the body. This prevents coagulation and enables the mixture to be transferred without risk into one of the large veins of the patient's arm; it should be done deliberately, about thirty minutes being occupied in allowing eight ounces to flow in. Very frequently transfusion produces slight temporary benefit, and in a few cases this has been permanent. Brakenridge[1] has reported five cases in which repeated transfusion was performed, but only one of these recovered, while Affleck has also reported a case which recovered after transfusion. In view of the fact that certain cases have recovered after transfusion it is probably worth trying after other means have failed, but it must not be forgotten that experience has shown its utter uselessness in the large majority of cases. No sufficient explanation of its action in successful cases has ever been given, but it has been suggested that healthy blood may act as an antitoxin in destroying some ferment which is breaking down the blood-corpuscle. Transfusion of saline solutions *per rectum* and intravenously to restore the bulk of the blood has at best only a temporary restorative action.

These articles form an abstract of various papers which I have published, and to which I must refer the reader for a full account of the literature and for the discussion of many points in the pathology

[1] *Trans. of the Medico-Chirurgical Society of Edinburgh*, 1891–92, ix.

and treatment of anæmia which are still in dispute. They are as follows:

"The Treatment of Chlorosis by Iron and Some Other Drugs," *Brit. Med. Journal*, 1893, i. pp. 881, 942.

"On the Nature and Treatment of Pernicious Anæmia," *Brit. Med. Journal*, 1895, i. pp. 965, 1025, 1083.

"A Summary of Sixty-three Cases of Chlorosis," *Edin. Med. Journal*, Nov., 1895.

"On the Amount of Iron in Ordinary Dietaries and in Some Articles of Food," *Journal of Physiology*, 1895, xviii.

"Observations on the Causes and Treatment of Chlorosis," *Brit. Med. Journal*, 1895, ii. p. 1473.

"The Experimental Production of Anæmia in Dogs," *Journal of Pathology*, 1896, iii. p. 385.

"Analyses of Iron in the Liver and Spleen in Various Diseases affecting the Blood," *Brit. Med. Journal*, 1896, i. p. 1077.

"A Case of Pernicious Anæmia," *Edinburgh Hospital Reports*, 1896, iv.

ADDISON'S DISEASE.

Here the most outstanding clinical feature is the peculiar bronzing of the skin which is so characteristic of the disease, but it is preceded and accompanied by a very marked sense of muscular weakness, often of cardiac weakness, and more or less dyspnœa, all of which symptoms sometimes call for a good deal of treatment.

Its usual duration is about one to two years, but from a few weeks to eight years are the extremes in reported cases. Some few cases have apparently recovered, but this must be very exceptional, and speaking practically it runs a fatal course. Death may occur from asthenia, often hastened by severe diarrhœa, or may be due to tubercle or cancer, or some intercurrent complication. After death the suprarenal bodies are found to be involved in some gross lesion—tubercle, cancer, hæmorrhage, external pressure—or may have simply atrophied. In a few cases the semilunar ganglia and nerves in their neighborhood seem to be the seat of the lesion, the glands themselves being apparently healthy. In those cases in which I have examined the blood, both corpuscles and hæmoglobin were up to the normal healthy standard and there was no leucocytosis. The symptoms are directly connected with abolished function of the suprarenal glands, and are now generally held to be due to an inadequate secretion of some substance which is essential to life. This seems to have been proved by an experiment of Abelous and Langlois, who kept animals alive after excision of the glands by injecting an extract made from them. Why the absence of the secretion should cause pigmentation and extreme

weakness is quite unknown as yet, although Schäfer and others have found that the extract made from the adrenal bodies of animals stimulates the circulation and nutrition.

The theory has also been propounded that the function of the capsules is to excrete some toxic substance from the blood, but this explanation seems to be completely discredited by the above-mentioned experiment, in which the administration of the glands averted death after their excision.

Treatment.—Cases due to tubercle, cancer, etc. are necessarily fatal. Arsenic has hitherto been the drug most relied on, but I cannot say that much benefit has ever been recorded from its use. Lately preparations made from the suprarenal bodies of sheep have been tried, and not entirely without success, although we have not yet anything like sufficient experience to enable us to judge of the value of such treatment. Oliver has treated two cases with suprarenal extract by the mouth, and the patient gained weight, became less pigmented and free from dyspeptic symptoms. Rolleston and others have reported similar results, but as yet there has not been a case of complete cure.

I have had an opportunity of treating three cases with the suprarenal capsules of the sheep. I used the fresh glands and gave them minced and raw, my reason for so doing being that there is no means of testing the genuineness of the various extracts and dried preparations which are on the market, and no means of knowing how much, if any, of the active principles is contained in them. They agreed perfectly well and were taken without any trouble spread on bread and butter.

Two of my cases showed no improvement whatever and at the post-mortem examinations were found to have extensive tubercular disease of the glands.

The third case was a well-built, finely developed lad, eighteen years of age, with no signs of tubercular or other constitutional affection. He presented the classical symptoms of the disease, and dated his illness from six months previously, when he had begun to feel very weak and had noticed the bronzing of his skin. Some time before this he had fallen from a height on to a plank which caught him in the small of the back and strained it severely, but he recovered in a few weeks. Otherwise there is nothing of interest in the history. He got first two, then three, and then six sheep's capsules daily, without experiencing any unpleasant subjective symptoms. In six weeks there could be no doubt as to the improvement—he was slightly less brown, but was much stronger and had gained four pounds in weight. In ten weeks the improvement was more marked, when he was put on a glycerin extract. It is now twenty-one months ago: he is able to do an ordinary day's work, but although somewhat

whiter, he is still a good deal pigmented. A curious point is that after he first got strong enough to work he omitted taking the suprarenal extract, and in a very short time felt ill and weak again. I am inclined to regard this case as one of atrophy of the suprarenal bodies, possibly following on the injury to his back.

For the cardiac weakness and dyspepsia heart tonics, stimulants, and the ordinary routine treatment of such conditions is all that can be done.

HÆMOPHILIA.

Little, unfortunately, can be added to what has been previously said in this System regarding the treatment of the constitutional tendency to bleeding. Some observations of A. E. Wright,[1] although very incomplete, may be adverted to as indicating a possible method of ameliorating the condition, although, being constitutional and hereditary, it must be extremely doubtful if it is susceptible to curative treatment. In a case of hæmophilia he observed that blood withdrawn into the capillary tubes took nine or ten minutes to coagulate as compared with two and one-half to five minutes in the healthy subject. In both the blood was found to coagulate much more rapidly if calcium chloride solution in varying strengths was added to it outside the body. He accordingly administered 15 grains of calcium chloride thrice daily and found that on the two succeeding days the blood coagulated much more rapidly. On the third day, however, the coagulation time had increased very considerably, and owing to other circumstances the observations were discontinued. Wright states, however, that in recurring epistaxis and in hæmoptysis the tendency to bleed is much lessened by the internal administration of calcium chloride.

It is always difficult to judge of the real value of drugs in hæmorrhage owing to the tendency of bleeding to stop spontaneously, but, quite apart from this, Wright's observations stand greatly in need of confirmation.

[1] *British Medical Journal*, 1893, ii.

DISEASES OF THE LIVER.

By JOSEPH EICHBERG, M. D.

General Considerations.

The liver has long been the butt for much irrational but well-meant therapeutic effort. As a last refuge of the puzzled practitioner, when driven to bay for a diagnosis, "torpidity of the liver" has done yeoman service, though the mental picture conveyed by the term is never very clear either to the lay or medical mind. Accordingly, the diagnosis made, the liver is "stirred up" with the same unctuous satisfaction with which the artist gives his *coup de maître* to the unfinished canvas on his easel. It is certain that the function of this gland is frequently perturbed; it participates, to a greater or less degree, in nearly all the acute infectious processes—evidence of this is furnished by the altered structure recognized on the post-mortem table; it is reasonably certain that functional derangements unconnected with structural change occur in this as in other glands; but so little do we know of such processes, that all statements regarding them must be purely speculative and must be received as such.

The reader of that wonderful classic in medicine, Foster's *Physiology*, cannot have failed to note the frequent admission of an imperfect knowledge regarding the normal processes that take place in this gland, even with reference to those functions that are generally assumed to be its prerogative. When the normal process is but little understood, it follows that we can speak but doubtfully regarding departures from the healthy standard, such as we assume to occur as the result of disease of its texture. This is greatly to be regretted, from the practical point of view; for the aim of our science to-day is to approach more and more closely to a rational system of therapeutics, based on physiology, pathological anatomy, experimental study, and experience. The absence of proper physiological data limits the scope of our endeavor, and leaves us on a purely empirical footing.

The largest gland in the body, receiving according to Béclard one-fourth of the entire blood-supply, naturally should play an important rôle in the economy; and yet the recognition of its true physiological importance can only be said to begin with the labors of Claude Bernard. At the present day we recognize the activity of the liver—

1. As a heat-producing organ. The blood of the sub-hepatic veins is the warmest in the body, and differs in temperature from that of the portal vein and of the abdominal aorta (in the dog) by as much as 3° in some observations of Bernard, the average being between 1° and 1.5° F. The production of urea is probably associated with this function.

2. As influencing the destruction of the red blood-corpuscles, from which source some of the bile-pigment is doubtless obtained. Whether there is a regeneration of blood-cells in the gland is not known.

3. As a sort of *screen* to the economy, preventing the entry of poisonous principles, absorbed from the portal radicles, into the general circulation. Its function in this respect may be compared to that of the lymphatic glands in the lymph-circulation. The liver converts poisonous aromatic principles, which arise from the splitting up of albuminous compounds in the gastro-intestinal tract, into harmless products. According to Bouchard and Roger, it exercises the same influence over ptomaïnes and alkaloids, which are in part stored up in its cells, partially converted into indifferent compounds, and in part excreted with the bile.

4. It secretes the bile, which is both secretion and excretion, and which is largely again restored to the circulation.

5. It is the storehouse for glycogen—the savings-bank of the economy for that material which is most readily consumed for the production of heat and force, and which is the first to disappear when food is withheld.

How large a part it may take in other processes we do not know; that such discoveries may be made in the future is most likely. With the material at hand, it will still appear that our resources for the treatment of its diseases are very limited.

There are perhaps few glands in the body in which the difficulties of arriving at exact knowledge are greater: experiments upon the lower animals are wholly unsatisfactory, in that the results are at variance with clinical experience; and some of the best-established beliefs are overthrown in the same way, by isolated cases, where nature seems to prove the utter falsity of our position. Thus, we have always believed that the retention of bile, or rather the resorption of some of its principles, was necessary to protect the economy from great waste and drain; yet we have the case of Paton, where, following an operation, a woman remained with a complete biliary fistula, through which, according to the reporter, the whole of the bile escaped. The fistula remained open from June, 1890, to March, 1892. During this time the patient's health and strength steadily improved. She enjoyed a hearty appetite, eating all kinds of food, not excepting fatty substances, which were taken with impunity. There was no

disturbance of the bowels; they moved regularly once a day, without the aid of any cathartic.

We shall have occasion to refer presently to the so-called cholagogues; it is not amiss to give the experience of an eminent clinician regarding them. At the Congress for Internal Medicine, 1894, Naunyn said: "It is, however, certain that, *judging from experiments on animals*, none of the cholagogue remedies (not even excepting bile-acids) possess such an effect as could be compared with the cholagogue action of a full meal of mixed diet. After the latter, the flow of bile is incomparably more abundant than after the use of alkaline waters, salicylic acid, ether and turpentine, or even after bile-acids,—to say absolutely nothing of olive oil."

In some experiments to determine the action of sodium salts on the secretion and alkalinity of the bile, in which as much as 25 grammes of bicarbonate of sodium were introduced into the stomach of the dog, Glass reached the following conclusions:

1. Alkalies taken by the mouth or introduced into the stomach do not appear in the bile.

2. The normal alkalinity of the bile is not increased by taking alkaline salts.

3. The relative percentage of the sodium and potassium salts in bile is constant. The exhibition of large doses of the salts of one or the other metal produces no corresponding increase in the bile.

4. There is absolutely no cholagogue action observed from any of the sodium salts.

Yet, in the face of these experiments, there is no practitioner to-day who does not, at times, feel that the exhibition of sodium salts, or the use of alkaline waters, is of incalculable benefit in the treatment of hepatic disorders; and the well-earned reputation of Carlsbad, Marienbad, Vichy, and other mineral springs, emphasizes most strongly the discrepancy between the laboratory test and clinical experience.

In judging of the effects of cholagogue drugs we are liable to err from another source. Stadelmann has shown that many wrong inferences have been drawn from variations in the quantity of bile, such variations being really physiological, and occurring without the intervention of medicine, from day to day. This diurnal fluctuation may amount to as much as from 20 to 30 per cent., and, taking an hourly standard, may in the course of two hours vary from 60 to 100 per cent. In Hammarsten's case of cicatricial stenosis of the common duct with subsequent fistula, the whole quantity in twenty-four hours varied from 200 to 600 c.cm. In Korte's case, where the common duct was open, the quantity passing into the bowel varied from 200 to 1200 c.cm.

As a result of his own experiments Stadelmann finds that a large quantity of water given by the mouth has no effect on the secretion of bile.

Of other agents investigated, he makes four classes:

1. *Having no cholagogue action.*

(*a*) Alkaline salts. Bicarbonate of sodium, chloride of sodium, sulphate of sodium, acetate of potassium, sulphate of magnesium, bicarbonate of potassium, tartrate, sulphate, and citrate of potassium. In large doses most of them diminished the secretion of bile.

(*b*) Purgatives and drastics. Gamboge, gamboge and soda, jalap (tuber and resin), convolvulin, soda salts of convolvulin, jalapin, jalapinate of soda, aloes, rhubarb, cathartinic acid, podophyllin, podophyllotoxin, senna, scammony, different soaps. Calomel showed no chologogue action, the bile being at times increased, unchanged, or diminished. After profuse diarrhœa the secretion of the bile was not lessened; after moderate diarrhœa, considerably so.

(*c*) Various remedies, such as alcohol and olive oil. These produced a diminution rather than an increase.

2. *Lessening the secretion of bile.* Pilocarpine and atropine.

3. *Possessing doubtful cholagogue action.* Antipyrin, antifebrin, caffeine, benzoate of caffeine, diuretin, santonin, Durand's remedy (which owes any efficiency it may possess to the turpentine contained). For each of these the cholagogue action is slight.

4. *Remedies with pronounced cholagogue action.* Salicylic acid in moderate doses. A dose of 3 grammes in dogs weighing 20 kilogrammes produced an increase often reaching 60 to 70 per cent. and lasting for twenty-four hours. At the end of the twenty-four hours there were decided symptoms of salicylic acid poisoning, dyspnœa and great unrest. Sodium salicylate, though not always uniform in its action, is a powerful cholagogue. The surest and most powerful cholagogue is the bile itself, especially the bile-salts. The administration of 4 or 5 grammes of the bile-acids results occasionally in an increase of 100 per cent., lasting twenty-four hours. If the dose is given twice daily, the increase amounts to 120 per cent. This dose is borne without injury. The greater the dose, the greater the secretion, both liquids and solids being increased. The greater part of the bile-acids administered is again excreted from the liver, both the bile-acids of the animal proper and the bile-acids of different animals when so used. After the use of salicylate of soda only the watery portions of the bile are increased, not the bile-acids. If we use the acids of beef bile for experimenting on the dog, the biliary secretion of the latter becomes green, and contains glycocholic acid, not normally found in dog's bile.

With regard to cholagogue drugs, it may be said that but few have

an action limited to the liver alone. It is true that we may influence the various functions of the liver by drugs; thus we have secretory cholagogues, by which the quantity of bile furnished would seem to be increased; excretory cholagogues, which do not stimulate the activity of the liver, but cause rapid expulsion of the bile from the intestine, thus preventing its resorption; the glycogenic function may be increased, as by the use of antipyretics or by bicarbonate of soda; while poisons that cause degeneration of liver-cells, such as phosphorus, arsenic, and antimony, diminish the glycogenic function to such a degree that animals poisoned by arsenic show no glycosuria after irritation of the fourth ventricle.

In the management of liver diseases, however, it often becomes necessary to address the remedy, not so much to any one function, as to the nature of the diseased process; as, for instance, in cases of malarial enlargement, of syphilis, amyloid degeneration, etc. The restoration of normal function is to be effected by the arrest of the diseased process, after which the liver may regenerate itself.

Many of the diseases connected with the liver are, primarily or secondarily, diseases of the gall-ducts. In order that remedial agents should prove effective here they must be eliminated with the bile, and thus exert a local action in passing from the liver. Very few, however, are the medicines which take this channel for elimination; the list of Chauffard embraces bile, turpentine, terpine, terpinol, rhubarb, salicylic acid, bromide of potassium, chlorate of potassium, iodide of potassium, and arsenic. Elimination of drugs through the liver takes place quickly. Lafter found that rhubarb, injected into the duodenum, appeared in the bile, in small quantities, after five minutes. Inasmuch as many of the diseased conditions of the bile-passages are associated with or dependent upon the entry of micro-organisms, that remedy should be selected which can best secure biliary antisepsis. For this purpose salol seems to answer most admirably. Its decomposition in the intestine into salicylic and carbolic acid promotes intestinal antisepsis, and allows of the prompt absorption of salicylic acid without the gastric disturbance likely to follow the direct exhibition of the acid; the drug can be used for a long time, as it is speedily eliminated.

Let us recur in general terms to the matter of diet. No single feature in the management of all hepatic affections, save only the acute inflammatory processes, is of so much importance as the strict regulation of the diet; none so difficult. The insufficiency of the liver-cells to functionate properly calls for the immediate withdrawal of all sources of irritation, of all substances stimulating the glandular activity in any form, or of those depending in a measure, for digestion and assimilation, upon the chemical properties of bile.

Alcoholic drinks, of all kinds, must be withheld absolutely. I have not been able to reconcile this general law with the advice of some authors to give whiskey for the relief of weakness in chronic liver disorders. There should be no departure from this rule, unless the physician is willing to wholly abandon his endeavor. Medication is manifestly futile where the cause of the disease is allowed to continue its action. In conditions seemingly desperate, the permission to drink implies the physician's consent to hasten the decline.

Fatty foods should be prohibited. The absence of bile from the intestine, or the reduction of its quantity, interferes with the proper saponification or absorption of fat; of that which is absorbed, some finds its way into the liver-cell, mechanically interfering with its action; the gastric disturbance, associated with nearly every form of liver disease, is likely to be aggravated if fatty food is retained in the stomach long enough to form butyric and other fatty acid compounds.

Starchy and saccharine substances must be reduced to the least quantity tolerated by the patient. Many patients are driven into open rebellion by the absolute curtailment of starches and sugars. Yet the alteration of function is doubtless connected with changes in the glycogenic process. To limit the demand made upon the diseased liver in this direction is only rational. But little bread, and no sweets, should be the rule. Green vegetables well cooked, stewed or fresh ripe fruits, nitrogenous food, and skimmed milk, buttermilk, or milk diluted with an equal quantity of effervescing alkaline water should make up the regimen, until the patient is relieved. Milk alone is the ideal diet; in practice it will be found difficult to thus restrict the patient, more particularly if the injunction as to taking active out-door exercise be faithfully followed.

A change in the entire habit of life is likely to be essential in many cases of hepatic disease. Too often the error is on the side of physical inaction. When the excess of food is added to sedentary habits, enforced or voluntary, the predisposing conditions may be regarded as well established. Under such circumstances, the regulation of the diet alone will not suffice.

Attention is also to be directed to maintaining the function of the skin. It is not assuming too much to affirm that the benefit which patients derive from the use of various thermal baths is due far more to the bath *per se* than to any medicinal effect of the dissolved mineral ingredients. The stay in the bath is rarely so prolonged that absorption through the skin can be of any value, seeing that the cutaneous covering, as a rule, resists imbibition, even after prolonged immersion.

The climatic element enters into consideration for a very large contingent of hepatic disorders, acute and chronic. This is true, in the

first instance, of those derangements developing while an individual resides in the tropics; the disease being directly due to peculiar tropical conditions. The military forces stationed in India, in Algiers, in Tonquin, in Egypt, have all suffered considerably from the operation of this cause. The disturbances to which the liver is liable are supposed by some authors to be the result of a primary over-stimulation of the hepatic cells, followed by subsequent exhaustion and lessened functional power. Change of climate is urgently indicated in these cases.

In the face of much experimental evidence to the contrary, most satisfactory results are to be obtained from a stay at some of the many saline and purgative springs. The physician has only to take the promenade at Carlsbad (Bohemia), where, following the old Greek fashion, tablets expressive of the gratitude of some of the many beneficiaries line the wall of solid rock, to become convinced of the powerful agency contained in that far-famed water. Another Hippocrates might almost construct the clinical history of the whole complex of abdominal derangements from these accumulated records.

It is not the lay mind alone which grows enthusiastic in view of the results achieved. The following remarks by Sir Joseph Fayrer, than whom none is more familiar with the peculiarities of disease in India, show that impartial critical judgment can only endorse the popular belief: "The waters [of Carlsbad] are indicated in the following disorders: In congestion and functional derangements of the liver, in catarrhal jaundice, in gall-stones or inspissated bile, and in chronic hepatic enlargements in which the serious structural changes of the amyloid or other degenerative processes have not taken place; in chronic engorgement of the portal system, in catarrhal conditions of the mucous membranes of the intestines and congestion of the hæmorrhoidal vessels, also in habitual constipation, incipient hæmorrhoids, and even in the earlier stages of tropical diarrhœa; in diseases of the spleen, such as chronic hyperæmia, and enlargement resulting from malarial poisoning; in chronic gastric catarrh, in cardialgia or gastralgia, dyspepsia, dilatation of the stomach; in those forms of albuminuria which take place as the result of abdominal plethora, and changes in the blood due to malarial poisoning; in renal and vesical gravel; in lithiasis; also in chronic catarrh of the bladder and hyperæmia of the prostate gland, and in some hyperæmic conditions of the uterus and its appendages; in all conditions in which the gouty diathesis manifests itself, and in general abdominal plethora and in obesity, whether of the abdomen or of the body generally. In the earlier stages of diabetes there seems little doubt, from the testimony of eminent authorities, that benefit may be derived. But Carlsbad is to be especially recommended to those who, after protracted

residence in India or other malarial climates, suffer from occasional recurrences of malarial fever, with consequent derangement of function and even alteration in the normal condition of the liver, spleen, and other abdominal viscera; who, without suffering from any positive disease, are failing in health, have impaired digestion, or distended condition of the abdomen, increasing fatty deposit in the omentum, and a tendency to fatty degeneration of the muscular system generally; who find themselves languid and depressed, unequal to much physical or mental exertion, show indications of incipient anæmia, suffer from dyspnœa, rheumatism, or gouty pains, irregular action of the bowels, congestion of the portal system, and distended hæmorrhoidal vessels—a state of things perhaps in some cases aggravated by excesses or irregularities of diet, or the neglect of due precaution as to the quantity or kind of alcoholic stimulants. Indeed, almost every European not the subject of organic disease who has spent some time in India would do well to avail himself of the resources of Carlsbad before he enters on the new course of life which lies before him, whether he be returning to India from furlough or retiring to spend the remainder of his life at home."

Carlsbad is probably the best known and most frequented of all the springs whose waters are of value in diseases of the liver or bile-passages. Vichy in France is held in high repute, though strong testimony is given by Kocher of Berne, himself a sufferer, in favor of the superiority of the Bohemian spring. In this country the waters of Saratoga Springs in New York, of Bedford Springs in Pennsylvania, of French Lick Springs in Indiana, and of Glenwood Springs in Colorado are pre-eminently of value.

I confess to a strong prejudice in favor of Glenwood. Situated on the western slope of the Rocky Mountains, at an altitude of about 6000 feet, surrounded by scenery of indescribable grandeur, with abundant opportunity and incentive for out-door exercise, with a climate delightfully cool in summer, it would seem especially favored in its location for the class of diseases in question. The thermal waters, which issue from the rock in close proximity to the leading hotel, have a rich percentage of salt, magnesia, and sulphuretted hydrogen. The saline taste predominates and effectually covers the taste of the sulphur gas. The water can be taken very freely, just as it issues from the spring; its overflow is conducted into a large artificial swimming-pool, built in the open air, where the bath can be enjoyed, the water having much the same buoyancy as would be felt if bathing in warm ocean baths. The natural heat of the water is tempered by the addition of cold spring water from the mountains. With some ingenuity other hot springs have been utilized for the creation of a cave bath, like the old Roman baths,

vestiges of which are found in the volcanic country about Naples. Some blasting, with the addition of a limited amount of masonry, has furnished spaces saturated with moist hot vapors, in which the skin is promptly stimulated to its greatest functional activity.

ACUTE HEPATITIS.

Under this term may be classed two varieties of diseased processes. The first, usually the result of excesses in diet or drink, is traceable, as a rule, to a recent indiscretion; is usually of very brief duration; the distribution of the process is general as affects the gland; and the changes, sometimes described under the head of "active congestion," are largely due to the increased afflux of blood. The typical examples of this disorder are found in persons who have "gone on a spree," taking little if any food and drinking to excess for many days in succession.

The treatment which has proved most effectual in my observation has consisted of lavage of the stomach, for the accompanying gastric catarrh—an invariable feature—the immediate administration of ten grains of the mercurial pill, followed the next morning by a free dose of salts, and a milk diet, with rest in bed. The pain in the hypochondrium is rarely acute, being rather a sense of heaviness and unpleasant distention than actual pain. Dry cups, sinapisms, or two or three small blisters, one inch square, may be applied externally. The disappearance of the hepatic enlargement can often be followed from day to day by careful physical examination. In the period of convalescence the diet should consist largely of milk, green vegetables, and lean meats. Water may be taken freely; when the stomach recovers slowly, hot water will be better tolerated and exert a better effect than iced drinks. After the preliminary purgation, the bowels should be kept open by a vegetable purgative, aloes, rhubarb, cascara or senna. As a stimulant to the impaired gastro-intestinal function, as also to the nervous system, tincture of nux vomica in 10-drop doses, after each meal, will prove satisfactory.

In the second class of cases the inflammation is circumscribed in distribution; the symptoms, though acute, are evolved more gradually; there is no direct connection between intemperance and the occurrence of the liver disease; and the treatment, to be effective, must be surgical rather than medical. This affection is generally known as—

Hepatic Abscess.

This is a localized acute hepatitis resulting in the formation of pus, and is most commonly metastatic in character, as secondary to diarrhœa or dysentery; some cases are traumatic; some are undoubtedly not

due to transportation of infectious material, as they contain a sterile pus. The treatment of this affection should be purely surgical; yet in every instance, except in military practice, it is the physician who is first consulted. The question of when to interfere surgically, what operation offers the best chance, and what promise of success may be held out to the patient, constitutes a legitimate field of inquiry.

The question of etiology enters into consideration for a much smaller part than might be imagined; for, whether the abscess be due to hepatic infection by the bacillus coli, the diplococcus, the tubercle bacillus, the amœba coli, the streptococcus citreus, the streptococcus pyogenes aureus, the bacillus pyocyaneus, the breaking down of an echinococcus cyst, or to suppuration communicated from calculous cholecystitis, the treatment is in all cases the same. It is not, therefore, necessary to make many classifications.

The possible recovery of the patient will depend less upon the etiological factor than upon two features of the disease: 1. The length of time intervening between the formation of the abscess and its recognition by the physician; 2. The promptness with which, after its recognition, a free exit is secured for the pus by an opening communicating externally. The longer the interval during which pus is unrecognized, the greater is the danger of the development of multiple abscesses—an occurrence that adds greatly to the gravity of the situation. Ferron reports 47 cases of liver-abscess submitted to operation, in 39 of which the abscess was single; of these only 1 died. In the remaining 8 cases there were multiple abscesses; 5 died.

The technique of the operation for hepatic abscess has been considerably improved in the last few years. I have, therefore, collected from accessible journals 101 cases, occurring since 1891, from which some statistics bearing upon prognosis and treatment may be deduced. Not all of these cases were submitted to operation. In some the proffered help was refused; in others the situation was too desperate to admit of operation; while in a third class the propriety of operation seems not to have suggested itself to the attending physician. In a considerable number there would seem to have been inexplicable and unwarrantable delay after the diagnosis and location of the abscess were no longer in doubt; thus, in my list there is one case of a woman, aged fifty, from whom, at the first aspiration, there were withdrawn two quarts of pus. Two weeks later a second aspiration removed two gallons; three weeks later a third aspiration drew off another two gallons. The following week, as there was evidence of re-accumulation, a trocar was inserted, and left *in situ*, and healing finally took place. An immediate incision at or shortly after the first operation would have ensured a more speedily recovery and saved the patient from possible danger of multiple abscesses.

As a result of the tabulation of these 101 cases, there seems to be no reason to doubt that the earliest operation, securing free drainage and easy escape of pus, is the best for the patient. As Irish has remarked, the danger of liver-abscess depends, not upon the operation, but upon the extent of the pus-cavity, and the relative amount of liver-tissue destroyed before operation.

Of the 101 cases, 83 occurred in male subjects, with 33 deaths—mortality 39.76 per cent.; 18 cases occurred in females, with 10 deaths—mortality 55.5 per cent.

Of the 43 fatal cases, the abscesses were multiple in 24, single in 9, not stated in 10.

Of the 9 fatal cases in which the abscess was single, in one it burst through the lung and the patient died of exhaustion.

One case occurred in a child of five. The patient was an Egyptian child, who suffered from dysentery. An operation gave prompt relief. There was a relapse of the dysentery three months later, and a second abscess formed in the other lobe. Operation was refused. The abscess finally ruptured into the colon. The patient died from hectic fever and a secondary brain-abscess.

One was a suppurating hydatid cyst, in which aspiration was made three weeks after the onset of the symptoms; after which, operation was delayed for another week. Death followed in a week from the time of the operation.

One was a suppurating hydatid that opened through the lung. The patient suddenly began to cough and expectorated fœtid pus and died in two days.

One abscess had before operation broken into the cellular tissue behind the kidney and colon, so that the right kidney lay free in the abscess-cavity. The aspiration was made two months after the onset of symptoms, and a free incision was practised the following day. Death occurred on the day of operation.

In one case the aspiration was made six weeks after the first appearance of the symptoms; then, after waiting a week, an incision was made; death occurred in forty-eight hours, from exhaustion.

In one case, occurring in a man of sixty, the abscess extended to the pelvis; the operation was performed late; death ensued from exhaustion.

In one case the abscess occupied the convexity of the liver; tentative aspiration, performed repeatedly, was unsuccessful in locating the pus. The patient died without operation.

In one case rupture had occurred into the peritoneum. A laparotomy was made, but too late to be of service. The patient died in a short time.

In no case of single abscess could death be in any way attributed to the operation.

Of the 101 cases, 24 are given as multiple : 2 of these died without operation, 22 were operated upon, of whom 20 died, the time of survival varying from five hours to three weeks after operation. Of the two cases which recovered, one was a child aged three and a half months, which developed two abscesses in the left lobe and one in the right ; each of these was incised, and dressed with gauze, and the recovery was rapid. The origin of the abscess was supposed to be infection from the umbilical vessels. In the other case, that of an old soldier, aged forty-eight, who had had chronic diarrhœa and dysentery, aspirations were made every five days for six weeks, then an incision followed. The abscess-cavity was opened, and allowed the examining finger to break into two adjoining abscesses, so that virtually the case was one of single abscess immediately after operation.

Of 24, given as single abscesses, other than fatal cases already cited, operation was performed in 20, all making a good recovery.

Of 28 additional cases, where the number of abscesses is not given, though a single one may be presumed to have existed as there was but a single operation, 24 recovered, and 4 died—one from dysentery, one from diarrhœa, one quite suddenly during irrigation, two weeks after operation, and one from hæmorrhage excited by irrigation, a week after operation.

Ten cases were treated by aspiration alone ; 5 recovered and 5 died. Of the 5 cases which recovered, one was traumatic, following a kick from a horse ; a teacupful of pus was withdrawn three weeks after the injury ; in another a teaspoonful of pus was withdrawn, there were no further symptoms ; one case was irrigated through a trocar left *in situ*, one had trocar left, without irrigation, and the last was much improved after a single aspiration. Of the 5 deaths following aspiration, two were due to the failure to find the pus, two occurred after repeated aspirations, no attempt at incision having been made, and one was due to chronic dysentery.

Aspiration alone gives a mortality of 50 per cent. Operation in all cases, including multiple abscesses, has a mortality of 34 per cent. ; in single abscess the mortality after operation is less than 8 per cent.

In nearly every case aspiration was performed as a preliminary step to further operation, without appearing to have prejudiced the subsequent course of the case. Reeve has reported fatal hæmorrhage from wounding of a large vessel by the needle during insertion—a possibility to be remembered in connection with Harley's suggestion of bleeding the congested liver by repeated withdrawals of blood by aspiration.

To avoid the graver surgical operation, while securing some of the

benefits of drainage, Manson has proposed to carry through the canula an over-stretched rubber tube of larger calibre than the canula. As the canula is withdrawn, the tube resumes its normal calibre, effectually preventing any leakage into the abdomen. Through the tube irrigation can be performed, if desired.

In operating it is scarcely necessary to wait for adhesions to form between the liver and the abdominal wall, nor to make the operation in two sittings, as the liver can be stitched to the abdominal parietes before being incised. When the abscess occupies the convexity of the right lobe, the transpleural incision with resection of the ribs offers the best chance for recovery.

The surgical procedure of the day will scarcely justify Little's proposal, of plunging the bistoury directly through the abdominal wall into the abscess-cavity regardless of the existence of adhesions. The liver should be carefully exposed, and, when not adherent, united to the edges of the wound by sutures before the abscess is opened.

At the preliminary aspiration the character of the pus should be carefully examined and cultures made, if possible. The pus may be absolutely sterile, as in a case of Tuffier's, following calculous cholecystitis. Following the evacuation, the calculi, four in number, were withdrawn ; the fourth slipped from the fingers and fell into the peritoneal cavity, and was found only after prolonged search. Some pus escaped during this time ; there was no reaction ; the recovery followed promptly. In another case the abscess burst directly into the peritoneum. A laparotomy was made, drainage secured, and the patient recovered.

The discovery of the tubercle bacillus in the pus from the abscess does not preclude recovery. In Robson's case the patient, who had been ill for a year, was treated by free incision, rubbing in iodoform, and drainage. Tubercle bacilli were found in the pus, though no other tubercular deposit could be found in the body. The patient made a complete recovery. This case is unique.

Where amœbæ are present, they may not be found by aspiration nor in the pus first discharged after evacuation, as they tend to adhere to the abscess-walls, rather than to occupy the cavity. The pus in these cases is very viscid. One or two irrigations with a solution of quinine 1 : 1000 have, in a reported case, caused the disappearance of the amœbæ and hastened recovery.

Most extraordinary parasites have been found inhabiting the pus. Grimm reports the case of a gardener's wife, who had an abscess, followed by pulmonary abscess. The liver-abscess was opened and drained. Pus from the liver, as well as the sputum, contained most curious flagellated protozoa, of which illustrations are given in the

original report. Burch reports a similar case, without pulmonary involvement. The mode of entry of the protozoa is unknown.

The dangers after operation are persistent vomiting, intractable diarrhœa, and the presence of other abscesses. No special rules apply to either the vomiting or diarrhœa, both due to sepsis. Hypodermic administration of a combination of morphine gr. $\frac{1}{4}$, atropine gr. $\frac{1}{150}$, hyoscine gr. $\frac{1}{600}$, has been of benefit. Rectal alimentation is scarcely indicated, as the bowel is not in the best condition for absorption. When the stomach is tolerant, and stimulation is required, champagne in small quantities is advantageous.

Early operation is the best safeguard against the development of asthenia at later periods. Age is no contraindication for operation. Two patients in my tables were under six months of age; both recovered. The oldest patient was a man aged sixty-three, who had passed through an attack of chronic dysentery. Recovery after operation was prompt.

Recuperative power in some cases is little short of marvellous. Wysman and Grappeling report the history of a man who, at the age of thirty-one, while living in India, had an abscess of the liver which opened through the lung. At the age of forty-three a second abscess opened into the intestine, and finally healed. They saw the man at the age of forty-five in Java. The third abscess of the liver now occupied the left lobe. He was seen in the out-door clinic of the hospital, and was aspirated, a pint of pus being withdrawn. After a few hours the patient insisted on returning to his home in the country on horseback. He returned in two weeks, the abscess was incised, drained, and recovery ensued.

Absolutely hopeless from the start are the cases of the so-called areolar abscess, in which the whole substance of the liver is permeated with streams of pus, so that on section it would almost seem as though a large sponge, with small meshes, had been filled with a thick purulent fluid. Such cases are very rare, only one being reported in my collection.

CHRONIC INTERSTITIAL HEPATITIS.

Under this head will be considered only that variety of chronic inflammatory change attended by increased hardness, new formation of connective tissue, atrophy of liver-cells, and diminished size of the liver which is not malarial or syphilitic in its origin. In both of these diseases changes take place similar in their ultimate effects to those of cirrhosis. The treatment for the causal condition, whether syphilis or malaria, will stay the process, and, in earlier periods of these diseases, permit of a restoration of function and structure.

The treatment of cirrhosis is concerned partly with the changes in the liver itself, but often more prominently with secondary symptoms due to the obstructed circulation through the portal distribution. The relief of these conditions calls for prompt interference, on account of the direct menace to life which they entail.

In recognition of the prominent rôle played, in some cases, by excessive consumption of alcoholic drinks, the treatment will demand the early and complete withdrawal of spirituous liquors; cirrhosis seems rarely to follow in the wake of excesses with malt drinks in adults. Aside from the consumption of spirits, occupation seems concerned in determining the incidence of the disease. Alison found that, in field laborers, the proportion of those drinking freely who suffered from cirrhosis was as 1 : 85; in those living in cities, who led active lives, as 1 : 42; while in city residents with sedentary pursuits it rose to 1 : 25. This statement is corroborated by the observations of Rosenstein of Leyden, who says that the industrious inhabitants of the Low Countries are very liberal consumers of ardent spirits, yet cirrhosis of the liver is a clinical rarity.

When it is possible for the individual to change his vocation, a more active life is to be counselled. This is the more imperative where primary tuberculosis is followed by secondary cirrhosis. Clinically this has been observed; and Brieger's experiments on guinea-pigs and rabbits showed cirrhosis very commonly after inoculations of tuberculosis.

Spontaneous cure of cirrhosis is not unknown. Frémont cites two instances. Many cases, too, come to autopsy in which, during life, no symptoms existed; yet the characteristic lesions appear in the liver. Duke reports a case of spontaneous cure by adhesions forming with the abdominal wall, with free anastomosis of the vessels. The portal congestion found relief in this way, and the symptoms rapidly disappeared. Morrison had previously operated to secure this result by making paracentesis, drying the anterior surface of the liver with antiseptic gauze, and then stitching it to the anterior abdominal wall, the latter having undergone a similar drying. The result was very satisfactory. Fagge, in 130 cases of cirrhosis, observed post-mortem at Guy's Hospital, found 43 where it was recognized only after death.

The object of the *treatment* in every case should be to enable the liver-cells not yet affected to carry on their function without embarrassment, to relieve the portal congestion, and to establish the collateral circulation. In meeting the first indication we are again confronted with the question of diet. Some lessening of functional power must have occurred before the patient applies for treatment; the tissue remaining intact should not be taxed too heavily. Milk diet is of very great value. All observers—French, Italian, English,

and German—agree upon this point. It commends itself by its easy assimilation, by its freedom from principles likely to lead to intestinal ptomaïnes, and by a certain diuretic action, which Lancereaux in particular claims to have observed. Highly seasoned food must be avoided, and meat or albuminous food should not be taken oftener than once daily.

The second indication calls for active exercise, the maintenance of the functions of the bowel, avoiding the use of constricting bands or clothing about the waist or abdomen, and limiting the quantity of fluid absorbed from the intestine. Drastic purgatives have also been employed; the objection to their use is found in the proneness to diarrhœa which often exists, and which sometimes demands treatment for its control.

The collateral circulation is promoted by the use of hot baths, warm compresses over the abdomen, poultices, massage, or by the establishment of adhesions. The gastric symptoms are likely to be prominent early in the disease. Nausea, loss of appetite, and occasional vomiting will often yield to milk diet alone. In the later periods vomiting is not so common, unless it be in the form of hæmatemesis.

Iodide of potassium has been highly recommended. Its efficacy seems to be restricted to those cases in which the lesion must be considered syphilitic in its origin. History of infection is not always clear; yet the iodide is not to be employed for any length of time, to the exclusion of other remedies. Should the case be one of syphilitic cirrhosis, the benefits of treatment with the iodide will speedily manifest themselves. Cases in which syphilis can be absolutely excluded need not be subjected to this treatment: time will be lost, and disappointment will follow its use. As Chauffard says, it is more potent for evil than for good.

The most common symptom causing distress is ascites. For its relief there may be given internally calomel, balsam of copaiba, acetate of potassium, salicylate of caffein, diuretin, bitartrate of potassium, and urea. There seems to be great unanimity of opinion that diuretics are vastly better than cathartics for the relief of the dropsical accumulation. With the establishment of diuresis not only the ascites but other symptoms are promptly improved. Calomel has many warm supporters; Palma goes so far as to say that if improvement does not follow its use in a case of cirrhosis, where ascites exists, the case is hopeless; if it helps, there is prompt diuresis and rapid relief. It never has any bad effect on the kidneys; and, if it should provoke diarrhœa, this is easily checked by tincture of opium. Of six cases of ascites complicating liver trouble the result in four treated by calomel was very beneficial; the quantity of urine was increased from three to ten times.

While calomel is being given, the use of mineral waters or of mineral acids should be discontinued, nor should salt be taken in any quantity at or near the time of its administration; as experiment has shown that bichloride is thus readily formed. Calomel may be administered in several ways. However administered, strict buccal antisepsis should be maintained by frequent rinsing with chlorate of potassium solution. Bouchard gives daily doses of from $\frac{1}{4}$ to 1 grain, continued for a considerable time.

The method of Saccharjin, endorsed by Palma, Sior, and others, is to give doses of $\frac{3}{4}$ grain six times a day for three days, then stop for three days, repeating the procedure until the patient is relieved. Palma has used larger doses, giving 3 grains three times a day for three days, then pausing for three days, and so on; or, the quantity may be reduced from an initial daily amount of 15 grains to 6 grains or less, always observing the rule that, following three days of treatment, there shall be three days of rest. My own experience with Saccharjin's plan, limited to three cases, has impressed me with its value. The manner of its action is not quite evident. Chauffard says that it acts not only as a purgative and diuretic, but also seems to have some effect in modifying the function and nutrition of the liver; perhaps has some effect even on the sclerotic tissue.

Acetate of potassium enjoys considerable favor in England, and is also recommended by Rosenstein and others. Sasaki has lately called attention to the use of cream of tartar in large doses, from 2 drachms to $1\frac{1}{2}$ ounces per day, the quantity averaging from $2\frac{1}{2}$ to 5 drachms. The patient has two or three stools daily. Ascites rapidly disappears; in some cases the relief is permanent. In 12 cases the remedy acted well. In addition, he advises iron, quinine, and light, nourishing diet. Diuretin can be given in daily amounts of from 40 to 60 grains.

Urea has been introduced in the treatment by Klemperer. Its main value is as a diuretic. Klemperer has not had as pronounced results from tapping as some authors; he treats recent cases by digitalis and calomel. When calomel produces bad effects, this author has seen great benefit from the use of urea. He gives 10 grains per diem, increasing the quantity to 15 or 20 grains, and continues its use for two or three weeks. He has never seen any unpleasant results. Its disagreeable taste is covered by giving milk immediately thereafter. Two cases are detailed. The diuretic effect in both was marked; in one case the secretion increased from 250 c.cm. for the day to 4000 c.cm.; in the other from 600 to 5000 c.cm. The abdominal measurement decreased from 106 to 86 cm. in the one, and from 97 to 82 cm. in the other. Ascites disappeared immediately in the first case, and never became troublesome again in the other. Klemperer recommends it strongly.

In every case of ascites the question of tapping requires consideration. There can be no reason for delay; there is every reason for its prompt employment. The accumulated fluid may or may not interfere with the kidney-function by pressure on the renal vessels; it will at least distend the abdomen, destroy the retaining tonicity of the abdominal wall, interfere with respiration, and, as recent experience has shown, it seems to act as a predisposing cause to the development of tubercular peritonitis or of chronic peritonitis. Ebstein has lately insisted on this point. Forster found 3 cases of tubercular peritonitis out of 31 autopsies in cases of cirrhosis, and Wagner saw 10 such cases. Additional argument is to be found in the fact that a single tapping sometimes seems to prevent any re-accumulation.

Carried out with antiseptic precautions, and with the measures described by Professor Musser (Vol. II.) to give support to the abdomen as the fluid is withdrawn, the operation is wholly devoid of danger. The large amount of fluids withdrawn at a single tapping seems to disturb the economy but little, and the system rallies quickly; nor is there any harm in its frequent repetition. A case is reported which was tapped and aspirated, in all, upward of three hundred times. Early and frequent tapping should be the rule.

Hæmorrhages sometimes call for treatment. The hæmorrhages may come from the bowels, stomach, or œsophagus. The venous distention becomes great enough to produce vascular dilatations, which finally rupture. Hæmorrhage may be the direct cause of death. It is usually very severe. Ergotin is not to be commended. Absolute rest, ice internally, and morphine are more to be depended upon. Diarrhœa can generally be controlled by means of salol, opium, and the salicylate or subnitrate of bismuth.

HYPERTROPHIC CIRRHOSIS OR HYPERTROPHIC CIRRHOSIS WITH JAUNDICE.

This has until recently been considered as essentially an incurable affection. Owing to the great rarity of the disease, no single individual is likely to accumulate much experience regarding it. Sior, following Saccharjin, has reported one case greatly benefited by calomel, after Carlsbad salts and iodide of potassium had failed. The remedy was given in 1-grain doses six times a day, for three days, then three days' pause. At the end of two months there was marked improvement.

As these cases are not dependent on an alcoholic cause, the injunction as to total abstinence might lose some of its force, were it not that alcohol would only prove an added source of irritation to the impaired gland. Diet should be simple, concentrated, and not stimu-

lating. Hæmorrhages are exceedingly common in this disorder; but the hæmorrhages are, as a rule, from mucous surfaces not connected with the portal circulation; their treatment is local. Tonics are to be given after bleeding is arrested. No remedy has been found to exercise any control over the curious nervous disturbances which develop in the late stages.

Mention may here be made of the very singular form of hypertrophic cirrhosis described by Ghose and Mackenzie as occurring in India, in the young children of native parents, the victims being mostly under one year of age, rarely over five. The pathology of the affection is wholly unknown, but the lesions are well described in the original communications. No treatment was found to be of any avail; the patients soon succumbed to the disease. Of 500 cases only 6 recovered. Well-fed children suffered more than those of the poorer classes, and often many children in one family were affected.

The pigmentary cirrhosis of diabetes, the malarial cirrhosis, the cirrhotic changes associated with venous stasis, and the cyanotic induration of heart disease, demand treatment of the causal conditions, and call for no special measures directed to the liver itself.

In chronic malarial enlargement no reduction of size is likely to follow the final extinction of the plasmodia. I have under my care a patient, whose liver reaches almost to the umbilicus, as a result of chronic malaria acquired during the war, more than thirty years ago. Aside from an uncomfortable distention, no particular inconvenience is felt; the size of the organ has not undergone any appreciable change. Acute malarial enlargements are sometimes met with, affecting the organ as a whole, or, as in a case of my own, limited to one lobe, and then simulating hepatic abscess. In this case, the free use of quinine and rest in bed caused the liver to return to its normal size inside of three weeks, though the enlargement had carried the border of the right lobe to within a half-inch of the umbilicus. In malarial cases, quinine, arsenic, and iron are sovereign remedies.

PASSIVE HEPATIC CONGESTION OR NUTMEG LIVER.

This symptom of impeded circulation through the right heart, whether as a consequence of tricuspid disease, obstruction in the lungs, or as the last stage in failing compensation of valvular disease of the left side, calls for no independent treatment. The remedies that will sustain the cardiac force and open up the peripheral arteries will overcome the venous congestion of the liver. Alcohol should not be employed. Digitalis, nitro-glycerin, strophanthus, strychnine, and caffeine can be given with advantage. When there is much pain

and fulness in the right hypochondrium, a single free purgation will often give relief, especially if combined with milk diet. Dry or wet cups act quickly and well. Repeated doses of drastic purgatives or of calomel may be tried, when symptoms do not yield promptly.

ACUTE YELLOW ATROPHY.

Many features of this affection suggest a close analogy with infectious diseases. It is so classed by Babès, who believes that in every case not due to toxic causes, as phosphorus, antimony, etc., there is an invasion of micro-organisms. He recounts four cases of which two died with symptoms of a fulminant hæmorrhagic septicæmia; the third case ran a less acute course, the fourth revealed at autopsy many streptococci in the portal vein, though the liver contained none. Cases occur at all periods of life, but treatment seems futile alike in all. Hæmorrhages can in part be controlled by mineral acids and atropine. During the periods of excitement, sometimes approaching mania, morphine will render good service; when collapse is impending, stimulants, may postpone the inevitably fatal issue.

AMYLOID LIVER.

The treatment of amyloid fever is the treatment of its cause. The indications are to arrest the suppurative process, remove caseous deposits in bone, treat an existing syphilis, or to give arsenic and quinine for obstinate malaria. To these may be added general tonics.

SYPHILIS OF THE LIVER.

The treatment of syphilis of the liver is essentially the same, under whichever form it may manifest itself. The manifestations are more various than has been generally believed. It is necessary to include congenital syphilis of the liver itself and of the biliary ducts, gummatous growths, sessile and pedunculated, and the early jaundice and acute yellow atrophy which Senator recently described. The jaundice appears in the earlier period and apparently runs the course of simple catarrhal jaundice. It is, however, very intractable to treatment, and only yields to anti-syphilitic medication. It is supposed to arise from pressure of enlarged glands on the excretory ducts, or from a possible swelling of the mucous membrane of the ducts in consequence of syphilitic infiltration; a lesion similar to the swelling of the buccal mucosa. Syphilitic yellow atrophy runs the usual course. Prior to Senator's report only seven cases had been recorded. He adds two of his own, one of which recovered. In seven of the total number of nine cases,

the patients were young girls. The virus in them seemed to manifest unusual malignancy.

As a congenital affection syphilis acquires great importance from the frequency with which it produces total obliteration or complete obstruction of the bile-ducts; the singular feature of such cases is that life should, none the less, be prolonged for six or seven months. The lesion has usually resulted in cicatrization before birth. Yet the treatment should not be omitted on that account. Mercury may be administered by means of daily injections or in the form of the gray powder. Congenital syphilitic cirrhosis of the liver has been found by Marchand, the fœtus being stillborn at seven months.

In the later periods of the disease in adults, the liver frequently undergoes enlargement, followed by subsequent shrinkage, counterfeiting hypertrophic cirrhosis. In such cases the calomel treatment as already described will yield excellent results. Amyloid liver following syphilitic infection does not seem to be amenable to treatment in the same degree, seeing that it has been found in the bodies of those who have had continuous treatment with iodides and mercury for considerable periods.

HYDATID CYST—ECHINOCOCCUS OF THE LIVER.

The treatment of hydatid cyst will depend upon the variety of hydatid formation and the character of the cyst-contents. Simple echinococcus can be cured by measures that will prove of no avail in the alveolar variety, and much will depend upon the presence or absence of pus within the sac. Of the alveolar variety, that form in which successive invasion of the healthy liver takes place by the growth of daughter-cysts at the periphery, only one case of recovery has been reported, that of Brenner. Recognizing the nature of the trouble during an operation, he scraped and curetted thoroughly the walls of the sac, and then touched the base everywhere with the thermo-cautery. Hæmorrhage was surprisingly slight. The patient made a rapid recovery.

For the treatment of simple hydatids, aspiration will suffice in many cases. According to Dieulafoy, two-thirds of all cases can thus be cured. Recovery may be hoped for, though the tumor be of very large size. It is particularly in echinococcus of the liver that its healthy portion undergoes sufficient proliferation to compensate for the tissue destroyed. As the cyst usually occupies the right lobe, it is the left which is hypertrophied from proliferation of liver-cells, bile-capillaries, and connective tissue. Dürig, in the Pathological Institute of Munich, and Ponfick have remarked the extraordinary power of proliferation in liver-cells.

In making the aspiration, a fine long needle thoroughly sterilized should be employed. The danger of converting a simple hydatid cyst into an abscess of the liver should be guarded against. It is generally advised to remove all of the fluid at a single aspiration. The patient is to be kept in bed for the following twenty-four hours. Some idea as to whether the echinococcus is dead or alive may be obtained from the proportion of albumin in the liquid withdrawn. The dead sac will contain more than the living. If a single aspiration fail, it may be repeated. In one case success followed after three hundred aspirations. Re-accumulation occurs after several months, if the hydatid survives.

Should the first simple aspiration be unsuccessful in relieving the condition, the second aspiration may, with advantage, be followed by the use of some parasiticide injections, such as the solution of corrosive sublimate, 1 : 1000 (Van Swieten's liquor), tincture of iodine, supersaturated naphtholated water, iodized sulphate of copper 5 : 100. These injections are allowed to remain for ten minutes, then withdrawn, the cavity being filled with boiled water, which is again withdrawn. For a sac containing two litres it is recommended to use 36 c.cm. of the bichloride solution. Even with the best precautions toxic symptoms have followed the use of the bichloride, though it is recommended by Bacelli. Aspiration has yielded the best results in young cysts with thin walls, when the collapse of the sac could easily occur, with healing by cicatrization.

Unpleasant sequelæ have followed the operation *per se*. These accidents as given by Achard are: Sudden death from nervous influence, as in other aspirations; urticaria; sudden collapse with subnormal temperature; nausea, vomiting, and disturbance of respiration; fever running to 104° and lasting for several days; increased sensibility of the abdomen and a small rapid pulse simulating peritonitis. It is probable that these arise from the toxic products in the liquids of the hydatid cyst. The dangers increase with the size of the sac.

Should the sac be suppurating, it must be treated as any other abscess. Morris says that cases of multiple hydatid cysts are unfavorable for surgical treatment: the multiple character of the tumor is, however, only recognized at the time of the operation. Operations have been successfully performed on very young children; a case is reported in a child five and a half years old.

MALIGNANT DISEASE OF THE LIVER AND BILE-PASSAGES.

Until recently the diagnosis of cancer of the liver was equivalent to a death-warrant; life was ordinarily terminated six months after

the certain establishment of the diagnosis. Surgery has triumphantly dealt with a sufficient number of these cases to make the outlook more hopeful in the future. Keen has collected a number of cases operated upon, and comes to the conclusion that liver-tumor and large parts of the liver may be removed without impairing the function of the gland, as liver-tissue is regenerated. If the cut surface be sewed into the abdominal wound there is little danger of the escape of bile into the peritoneal cavity. Such an accident, when occurring, is not as dangerous as was once believed. The principal danger during operation is from hæmorrhage. This can be obviated by operating in two sittings, leaving an elastic ligature around the tumor after the first operation. The mortality of cases which he collected was only 10 per cent.

Primary malignant disease offers a better prognosis from operation than secondary; in the latter class, the malignant deposits are usually multiple. Primary carcinoma is comparatively rare, yet White reports ten cases from Guy's Hospital.

Hodenegg removed a primary cancer of the liver; the patient was still alive after eighteen months, seemingly in good health.

Robson operated upon a rapidly growing tumor in a woman aged fifty-four. The tumor was primary in the gall-bladder; a single secondary nodule was discovered in the liver at the time of operation, close to the gall-bladder. It was removed with the gall-bladder. The portion of the liver removed weighed half a pound. The tumors were squamous-celled epitheliomata. There was complete recovery with a rapid gain in weight. The operation was made with the elastic ligature; an incision was made around the growth, at the distance of half an inch, the ligature slipped into this and tightened, and left in place until the slough separated.

Keen's case was one of cystadenoma of the bile-ducts in a woman aged thirty-one. Recovery was effected in forty-two days.

Bergmann removed a large adenoma the size of a child's head from a man aged sixty-one. Four months after operation the patient was well.

Tiffany removed a tumor composed of liver-tissue and fine calculi from a man, who was well eighteen months after operation.

Israel extirpated a primary sarcoma from a girl aged fifteen. The base of the tumor was 15 cm. long. Removal was accomplished by thermo-cautery and the elastic ligature. The patient recovered promptly from the operation, but death followed in three and a half months from internal metastatic growths. Israel says that of 14 cases of liver-tumor operated upon only 2 terminated fatally.

Tricomi has excised the entire left lobe from a young man of twenty-three with perfect success.

Other successful operations may be mentioned:

Langenbuch extirpated a lobe of the liver. Von Eiselsberg removed a large carcinoma. Cysts of the liver have been operated upon by Lind, North, König, Terrillon.

FATTY LIVER.

Fatty liver represents, in the vast majority of cases, the accumulation in the liver-cells of unoxidized or imperfectly oxidized material for combustion. The treatment of the condition must always take account of the cause. Deficient combustion will arise from various circumstances:

1. A surplus of fatty food; prolonged use of fats as medicines (cod-liver oil, for example); or disturbances of gastric and intestinal absorption.

2. Deficient exercise, with excesses in diet and a native tendency to obesity.

3. Imperfect supply of oxygen to the liver-cells. Blood-changes may cause this, as in pernicious anæmia, chlorosis, etc.; or the chronic cachexia of wasting disease, as cancer; or mechanical difficulties in the pulmonary circulation, due to disease of the lungs or heart, favoring venous stasis.

4. Poisons which chemically affect the nutrition of the liver-cells; such poisons may be toxins of acute infectious processes, as of puerperal fever, septicæmia, pyæmia, or of malignant variola, etc.; or they may be poisons from without, as alcohol, morphine, arsenic, antimony, phosphorus, and others.

The treatment will have due regard to the cause. The best results will be obtained in the liver that is fatty from drink, from overfeeding, from too little exercise, or when there is the tendency to obesity. It is surprising to see the rapidity with which reduction of size will follow graduated exercise, and the proper limitation of both quantity and quality of food and drink. The dietary of Oertel or Ebstein may be closely adhered to; should the patient's strength permit, the process of "taking off fat" can be hastened by the systematic use of Turkish baths.

In cachectic disorders, in organic changes in the heart and lungs, in infectious diseases and disorders of the blood, no treatment need be directed to the liver.

PERIHEPATITIS.

Inflammation of the capsule of the liver and of its peritoneal investment may be either acute or chronic. The acute variety, most commonly due to trauma or impending rupture of an abscess, requires anodyne remedies and local application of heat.

The chronic variety calls for especial attention. This variety may also arise from trauma of the liver. The only case of chronic perihepatitis that has come under my care when the diagnosis could be made during life, developed as the result of irritation of the capsule by the broken ends of the fractured ribs, the patient having sustained a severe fall. The Germans have given to this condition the name of *Zuckerguss-leber*, in view of the enormous thickening of the pearly-looking capsule, which gives the gland the appearance of having been surrounded by a layer of icing, such as confectioners use to decorate their products. The process is not ordinarily attended with pain. As the thickening increases the liver enlarges, but finally diminishes in size from contraction of the new-formed tissue. As in cirrhosis, the portal vessels suffer from compression. Ascites develops comparatively early, and persists. Frequent tapping must be resorted to. Rump reports the history of a young woman, who was tapped 301 times in sixteen years; death finally ensued from exhaustion; the capsule varied in thickness from 8 to 14 mm. Palliation of symptoms due to portal obstruction, by the means already described as a feature in cirrhosis, should be attempted. Local applications of warm solutions of muriate of ammonia, kept constantly next the skin for several weeks, have been thought to be of service. The moist heat was doubtless the efficient agent here.

Subphrenic abscess and other suppurative processes originating outside of the liver scarcely call for mention here. They are surgical affections entirely, for whose occurrence the liver is rarely responsible.

As pathological conditions not amenable to treatment may be cited tuberculosis of the liver, cystic degeneration of the liver, similar to cystic degeneration of the kidneys (of which only one case has been reported), and the enlargement in Hodgkin's disease. A specimen of cystic degeneration of the liver has just come under my notice. It was found in the body of a woman, who had in addition cystic degeneration of the kidneys and ovaries.

PYEPHLEBITIS AND PYLETHROMBOSIS.

The formation of a clot in the portal vein, with or without accompanying inflammation of the vessel-wall, produces certain symptoms of which the treatment can only be palliative. Ascites, hæmorrhages from stomach or intestines, disturbances of digestion, and the febrile symptoms dependent upon inflammation about the clot, may demand attention. Measures have already been discussed which will meet these symptoms; the cause of the trouble is not to be influenced by medicine. No remedies will dissolve the thrombus.

MOVABLE OR FLOATING LIVER; INJURIES OF THE LIVER.

For the treatment of this anomaly, surgical aid must be sought, Bolognesi says it may affect the entire organ or a single lobe. Unless the latter is distinctly pedunculated, it is not to be removed. Langenbuch has twice made hepatopexy, fixing the liver in one case to the abdominal wall, in the other to the costal cartilages. Marchant reports another successful case by fixation to the cartilages. In a boy who had tricuspid insufficiency, Leube believed the heart lesion to have caused the displacement by the constantly recurring backward wave in the hepatic veins.

Wounds of the liver and rupture of the organ occur only as the result of violence. Though formerly considered necessarily fatal, prompt intervention will save life. Micheli reported to the Surgical Congress in Rome two cases in which the liver had been wounded, where the wound in the liver was sutured, the abdomen thoroughly cleansed, and the external incision closed. Both recovered. Smits narrates the history of a Malay, so far exsanguinated that anæsthesia was not attempted. The stab-wound in the liver was closed by mattress suture, and the blood was washed out of the abdomen, which was then closed. The parts united by primary union, and the case was practically well in six days.

With regard to rupture of the liver, an important practical suggestion grows out of the case of Korbler of Dorpat. In the efforts to resuscitate a new-born asphyxiated child, Schultze's method was followed rather vigorously. The child revived, but died soon after. The autopsy revealed two tears of considerable length in the liver.

SIMPLE OR CATARRHAL JAUNDICE—CATARRHAL CHOLANGITIS.

A simple jaundice often appears in the course of an acute gastro-duodenal catarrh. The inference is that the catarrhal process has extended into the bile-passages, and the swelling of the mucous membrane has resulted in temporary obstruction of the ducts, with resorption of bile. Accordingly, the case is treated for the gastro-duodenitis—often with the happiest results. The object of the treatment is to secure, as quickly as possible, free passage for the bile.

The old, established plan consists of the free exhibition of saline purgatives and alkaline waters. Excessive purgation is to be avoided. In 1871 Krull advised dealing with cases of simple jaundice by copious injections of cold water. Every morning an enema of from two to three pints of cold water (temperature 60° F.) is given, with instructions to the patient to retain it for five or ten minutes. Usually, after

one or two attempts the patient has no difficulty, the bowel becoming tolerant; the only untoward feature may be a few colicky pains. It is claimed for the cold water that it stimulates free peristalsis, possibly as high as the inflamed duodenum, where pressure may dislodge the *materies morbi*, the offending plug of mucus, by the contractions of the upper bile-passages or of the gall-bladder. There has also been observed a distinct diuretic effect as the result of these injections. A third advantage claimed is in the regular evacuation from the bowel of toxic principles due to decomposition in the intestinal contents owing to the absence of bile. Krull's suggestion has been warmly endorsed by Chauffard and others.

Faradization of the gall-bladder, or rather of the region about it, has been proposed by Gerhardt. This is but the revival of an old suggestion, for we read that Erasmus Darwin "gave half a score of smart shocks from the coated bottle to a man who had been jaundiced for six weeks, and the same day the stools became yellow."

Massage of the gall-bladder has also been tried. The increase of pressure on the contents of the gall-bladder, due to the manipulation, would, it was hoped, force the passage and thus permit the flow of bile.

In several cases I have lately given dilute nitro-muriatic acid, with seemingly good results. The mineral acids have been used before, their employment being based on the theory that they would chemically irritate the mouth of the common duct, inducing reflex contraction. This explanation never seemed entirely adequate. In my own cases I have tested the gastric secretion during the time when the stools were clay-colored, and found hydrochloric acid either much reduced or absent. The indication for its use thus seemed clear. These observations, as far as they go, only corroborate the recognized fact of the interdependence of the digestive fluids—so that perversions of the normal processes in one gland affect in some way the quality or quantity of secretions from others.

Inasmuch as the duration of an acute attack scarcely exceeds a week, a rigid and exclusive milk diet can be maintained without much discomfort to the patient.

Not every case of simple jaundice can be classed as catarrhal; witness the instances of emotional jaundice, in which indulgence in an outburst of passion is followed by the characteristic discoloration of the skin and the absence of coloring matter in the fæces. The mechanism of this occurrence has been made more apparent by the researches of Doyen on the expulsion of the bile. The following are his results: The splanchnic major is the direct motor nerve of the bile-passages; its irritation produces contraction of the entire apparatus for expulsion of bile. The sphincter at the duodenal end

may contract so tightly as to prevent the escape of any fluid into the duodenum. Relaxation of the bile-passages is accomplished by reflex action. Irritation of the central end of the splanchnic major produces relaxation. Irritation of the central end of the vagus causes contraction of the gall-bladder with relaxation of the sphincter. Emotional jaundice is probably due to spasmodic contraction of the sphincter. For its relief, in addition to milk diet, nerve-sedatives, as bromide of sodium or valerianic ether, may be employed.

It has been recommended that patients drink freely of water, with the view of making the bile more limpid, and thus favoring its escape. The re-establishment of the flow is accompanied by a marked diuresis and a sudden increase in the proportion of urea; the total of urea for the day may reach 50 grains. The resumption of the functional activity in the liver-cells is supposed to account for this.

Cases of simple catarrhal jaundice sometimes run a chronic course, and lead to a mistaken diagnosis of permanent organic obstruction. Two instances may be cited, which will also illustrate the advantage of exploratory incision. Terrier's patient, a man aged fifty-four, entered the hospital service with a swelling of the liver, suggesting a possible hydatid cyst. Exploratory punctures were made with negative result. Jaundice supervened and became chronic. An exploratory laparotomy showed a very large congested liver, but neither cyst, tumor, nor disease of the biliary ducts. A biliary fistula was established, and, from the fifth day, the liver diminished in volume, the urine contained less pigment, and the fæces resumed their normal color. More instructive is the history of Routier's case: A man who had intense jaundice for three months, with progressive emaciation, submitted to exploratory laparotomy. There was no lesion of the liver or bile-passages, but in the course of the exploration a sort of expression of the gall-bladder necessarily occurred. Despite the apparent uselessness of the operation, jaundice disappeared in a few days, and a permanent cure resulted.

Itching of the skin in jaundice often proves the most annoying feature of the trouble. According to Potain this symptom bears no relation to the intensity of the discoloration. It appears most intensely in the palms and soles of the feet, and the entire surface may prove a source of constant torment. It is often a late symptom, and may even develop or remain after jaundice has disappeared. For its relief warm baths, washing the skin with a 2 per cent. solution of carbolic acid, or diluted vinegar, or lemon-juice, mercurial ointments, or spirituous lotions containing hydrocyanic acid, have all been recommended. An excellent application is a mixture of equal parts of sweet spirit of nitre and alcohol. Internally the bromide of sodium or of strontium, in large doses, will diminish the cutaneous sensibility.

WEIL'S DISEASE—MALIGNANT OR INFECTIOUS JAUNDICE.

The treatment of this process, like the management of the other infectious diseases, is largely symptomatic. Properly speaking, its consideration does not belong to the study of diseases of the liver. It is generally placed there because of the prominence of the jaundice. The indications according to Chauffard are to keep the renal emunctories free, by the use of milk diet, to which may be added large rectal injections of cold water, made feebly antiseptic. Of intestinal antiseptics the best are the insoluble salicylate of naphthol, or of bismuth, salol, or benzo-naphthol in small doses, frequently repeated. The disturbance of ureogenic function calls for oxidizing agents, benzoate of sodium, oxygen inhalation, or hypodermic injections of ozonized turpentine, well diluted.

Fever may require antipyretic medication; cold sponging, an ice-cap to the head, or, if nervous symptoms are very prominent, the cold bath. When occurring in epidemic form, it is desirable to remove the patient as soon as possible to a locality with good general sanitary arrangements; to boil all drinking water, and to avoid all suspicious articles of food. After a few large doses of calomel give some simple purgative with free injections of cold water. Emetics are contraindicated. Internally muriatic acid or nitro-muriatic acid, in the form of lemonade, will be very acceptable. These are the directions given by Hensing. Severe internal hæmorrhages are to be treated by morphine, mineral acids, and turpentine. Singultus is sometimes very severe. Morphine may control it; or rectal injections of asafœtida made into emulsion with yelk of egg, 30 grains of the gum to the yelks of two eggs. Alcoholic drinks are to be avoided.

ICTERUS NEONATORUM.

This common disturbance scarcely calls for treatment. Usually the jaundice is transient; the trouble corrects itself. When the jaundice persists for several weeks, suspicion should be directed to a possible stenosis of the bile-ducts, depending on a hereditary syphilitic infection. Anti-syphilitic treatment is to be instituted.

SUPPURATIVE CHOLANGITIS.

This affection, associated as it is with a suppurative inflammation of the gall-bladder, is generally due to infection from the intestinal tract. The treatment is purely surgical; the object being, as in liver-abscess, to provide prompt and free exit for the pus and thorough drainage of the gall-bladder.

Diphtheritic cholangitis or cholecystitis occurs as an accident in acute infectious disease.

CHOLELITHIASIS—GALL-STONES.

While the question of the pathology of these concretions may be as yet unsettled, the lines of treatment have been carefully drawn, and are now accepted with little objection from any quarter. Minor details may afford ground for dispute, but the general plan of the management of these cases is endorsed by all.

Gall-stones are certainly formed more commonly in the gall-bladder than is generally believed. Bollinger states that they occur in one of every 14 persons in Central Europe; in Munich 5.4 per cent. of all persons, in Strassburg 12.3 per cent.; the difference being supposed to be due to the lessened consumption of water in Munich. For the sexes, the proportion was 3 per cent. in males, 9.8 per cent. in females.

Proper treatment has not always been instituted, because the diagnosis has been held in abeyance awaiting the appearance of the so-called cardinal symptoms, jaundice, and the presence of gall-stones in the stools. Yet these symptoms are often wanting. In a frequently cited case of Bardeleben's, the only complaint was of pain in the right side; at no time was there jaundice, and no gall-stones were passed. The gall-bladder contained 116 calculi.

The attack of biliary colic is generally the first event in the clinical history to call for treatment. After having in the course of twenty years tested all remedies, Kraus of Carlsbad says very positively there are only two remedies for the attack, morphine and chloroform. Morphine is to be given subcutaneously; where it is not well borne, or fails to give relief, then chloroform is to be administered by inhalation. This opinion is based on an experience of 2249 cases.

Harley, Stecker in Germany, and others strongly insist on the use of belladonna, in full doses, during the attack, in place of opium or its derivatives. They claim that it relieves the spasm, lessens pain, and stimulates the expulsive fibres.

Olive oil has, in the practice of some observers, seemed to possess virtues which others have failed to perceive. It is given in doses of from 6 to 8 ounces; the medication is well borne and is wholly devoid of danger. The dose may be repeated in half an hour. Villemin, Chauffard, and others attest its value. Rosenberg claims for it a powerful cholagogue action, the increase of secretion commencing thirty to forty-five minutes after the ingestion of the oil. The bile thus formed in excess is a remarkably fluid product. Olive oil may also be given *per rectum*, according to the suggestion of Fleiner; 400–500 c.cm. of pure warm oil may be given *per rectum*. A slight laxative action is thus obtained.

In place of olive oil Ferrand administers 200–300 c.cm. of glycerin with an equal quantity of chloroform water.

Where previous attacks have occurred, it is sometimes possible to determine that biliary colic is impending. Under such circumstances valerianic ether, given in capsule, is said to allay the sensibility of the ducts. Here, too, olive oil may be used with advantage. Salicylate of sodium will increase the flow of bile, act as an intestinal and biliary antiseptic, and render the bile more limpid, thus assisting materially in the expulsion of inspissated secretion, which often contains a biliary gravel. Glycerin, as suggested by Ferrand, given in doses of 15.0 to 30.0 grammes daily, dissolved in Vichy water, also renders the bile more fluid. Indeed, it is claimed that any action possessed by olive oil is due to its decomposition into glycerin and fatty acids.

Goodhart and other observers wholly deny any therapeutic virtue to olive oil. It is certain that actual expulsion of biliary calculi rarely follows its use.

The greatest importance attaches to the treatment in the interval. The formation of additional concretions can often be prevented, and actual solution of the stones seems to occur in some cases. The first object of the treatment is to relieve the gastro-intestinal catarrh, upon which the formation of the calculi primarily depends. This disturbance plays a larger rôle in the development of cholelithiasis than does inspissation of the bile, or precipitation of bile-salts from reduced alkalinity of the secretion.

The treatment of the gastro-duodenal catarrh, which extends into the bile-passages, calls for strict regulation of the diet. The smallest quantity of a mixed diet capable of maintaining the nutritive equilibrium is the proper diet for the patient. Sugars, starches, and fats should be greatly curtailed. Substances containing a notable percentage of cholesterin, such as brain and the yelk of eggs, are decidedly objectionable. The same is true of effervescing wines, malt and spirituous liquors. Green vegetables may be taken freely, as also some fresh ripe fruits, apples, cherries, peaches, and pears. The table water should not contain calcareous salts in any quantity. The meals should be frugal, taken at regular hours, and not exceed three per day. There should be regular hours for sleep and exercise.

Life in the open air, combined with active physical exercise, assists materially. The best form of physical exercise is horseback-riding. The jolting acts mechanically to empty the gall-bladder, and the general stimulus to nutrition promptly influences the gastric and intestinal catarrh. In the case of a young married lady, who suffered severely from repeated attacks following her first confinement, horseback exercise was taken daily for a year; she abstained wholly from bread and

starchy food, and has not had an attack since that time. Pürckhauer says that horseback exercise is much in vogue as a factor in the treatment of gall-stones in the West Indies. Ladies should be warned of the necessity for removing any constriction about the waist. Tight lacing is generally thought to favor the formation of biliary calculi.

Hot baths are of value. The greatest benefit, in the interval, is to be expected from a visit to one of the alkaline springs, especially Carlsbad, Marienbad, and Vichy abroad, or to Saratoga, Bedford, French Lick, or Glenwood Springs in this country. The waters of these springs appear to exercise a positive solvent action upon the stones; after taking the waters for eight or ten days many patients experience a sharp attack of biliary colic, which subsides with the expulsion of one or of several stones. Even where the cure is not immediate, a marked improvement begins; the attacks grow less severe, and occur at longer intervals. The waters give more satisfactory results if taken fresh from the springs; their use can, however, be continued at the patient's home for a long time. Rectal injections of olive oil, or glycerin taken internally, can be regularly taken during the interval. Massage and faradization can be tried.

The passage of the gall-stone into the intestines is not always easy. It may become arrested at the mouth of the gall-bladder, in the cystic or common ducts, or just beneath the papillæ of Vater, in the thickness of the intestinal wall. When it reaches the intestines the patient is not wholly free from danger. The stone, if of any size, may produce intestinal obstruction; or, if small, it may grow larger, from successive precipitation on its surface. In such an event timely laparotomy, with incision of the intestine over the impacted calculus, may save life. No great effort should be made at the time of operation to push the stone into the large intestines; the parts are liable to considerable bruising from the roughened surface of the calculus. Excision of the stone and closing of the intestine is the better procedure.

Another remote evil following the development of cholelithiasis is the occurrence of cancer of the gall-bladder or ducts. I am convinced that, in some cases at least, the association of cancer of the gall-bladder with biliary calculi is due to primary calculus, with secondary development of malignant disease. A case came to autopsy in the Cincinnati Hospital in which the gall-bladder was dropsical; the communication with the cystic duct was obliterated. In the lower part of the cystic duct, imbedded in a mass of carcinomatous tissue, was a gall-stone almost as large as a cherry. The closure of the cystic duct at its entrance into the gall-bladder was, as I regarded it, due to ulceration and cicatrization following the passage of the stone. The stone became arrested in the lower part of the duct, and, by the

irritation it set up, led to the development of malignant disease. The relation which gall-stones bear to cancer of the gall-bladder or ducts is of great moment as bearing on the question of the surgical treatment.

When shall an operation be undertaken in a case of gall-stones? What operation is to be chosen? Surgeons of eminence regard operation as indicated in the following conditions:

1. In cases having repeated attacks of biliary colic, with rapid exhaustion of the patient.

2. When there is evidence of suppuration in the gall-bladder, or its neighborhood, set up by the gall-stones.

3. In cases with acute or perforative peritonitis, starting in the region of the gall-bladder, when there is a distinct history of gall-stones.

4. In obstructive jaundice, when there is reason to think the common duct is occluded by gall-stones. As bearing on the last indication, Courvoisier's sign is of value: "A distended gall-bladder is not found in obstruction of the ductus choledochus from stone; if the gall-bladder is distended, then the obstruction is due to other causes, as cancer or stricture of the duct."

There is also a consensus of opinion that jaundice, long continued, seriously prejudices the patient's chances of recovery; the danger is greater in direct proportion to the intensity and duration of the jaundice. Internal therapy must not be extended over too long a time if the patient suffer from prolonged or frequently recurring attacks. The earlier operation gives the best chance for recovery.

As to the choice of operation, it is difficult to lay down any hard and fast rules; the anatomical conditions revealed at the time of operation will greatly modify the surgeon's course. Mermann of Heidelberg, after an extensive review of the cases coming to operation in the surgical clinic, sums up as follows:

Cholecystendysis is the proper operation where the walls of the gall-bladder are nearly normal, and where its contents are either bile, mucus, or dropsical effusion. This operation gives the best prognosis.

Cholecystectomy is only indicated in extensive ulceration of the mucous membrane or malignant infiltration of the gall-bladder. In either event, the patency of the common duct or cystic duct must be assured by careful examination at the time of operation.

Choledochotomy is the operation where a stone is firmly impacted in the common duct and cannot be pushed into the intestine by gentle pressure.

Cholecystenterostomy must be restricted to those cases in which the common duct is rendered impervious by other causes than gall-stones, or where the removal of the stone is rendered hazardous on account

of difficulties in technique. To allow the stone to remain in the common duct is always dangerous. McGraw, in corroboration, says that the stone, if left behind, continues to cause pain and colic, and leads to further adhesions about the duct. The operation may give relief, though it fails to cure; but it is not known how long the fistula thus established between the duct and intestine will remain open, as the tendency of the orifice is gradually to close. Establishing a permanent external biliary fistula is the better plan, if the patient is too much depressed by the long-continued jaundice to bear a tedious operation. To this I may add that the making of an external fistula is by no means easy, as the shrivelled, thickened, and retracted gall-bladder, often adherent to neighboring parts, cannot always be approximated to the abdominal wall.

For all other cases, such as suppuration of the gall-bladder without ulceration, in normal gall-bladder, where the cystic duct is not patulous, or where there is danger of cholæmia from grave and prolonged jaundice, *cholecystostomy*, in a single operation, is the proper procedure. To make the operation in two sessions is only permissible when the patient's general condition is bad. The biliary fistula, after cholecystostomy, if left to itself, will usually close spontaneously. When it fails to do so, a bend or kink in the common duct is responsible. Small fistulæ are ordinarily not troublesome.

It remained for Gallic ingenuity to attempt the chemical experiment of effecting solution of an impacted stone during operation. In an operation made by Joutan on our distinguished colleague, Dujardin-Beaumetz, ether was injected into the obstructed duct to dissolve the obstacle. The patient, fortunately, survived to express his own disapproval of the innovation. The few drops employed could have had but little solvent action; to use a large quantity in the duct would mean to increase the danger of rupture.

Malignant disease of the gall-bladder and ducts has been considered in connection with malignant disease of the liver. Surgical aid may be invoked as the only possible relief.

As a pathological curiosity may be mentioned tuberculosis of the gall-bladder. The only case on record is reported by Heddæus. The condition was discovered at autopsy.

In many cases of liver disorder, acute and chronic, the full functional activity of the gland is not restored, though the more urgent symptoms may have been relieved. It is easy by a premature relaxation of precautions as to diet, exercise, and mode of life, for the patient to drift back into his previous morbid state. A test of the ability of the liver to do its full duty can, it is claimed, be made with a fair degree of accuracy, by examination of the urine. A constant

deficit in the total daily elimination of urea should, in the absence of disease of the kidney, be construed as depending on imperfect hepatic activity. Similarly, the appearance of strychnine in the urine, after its administration in physiological doses, may be taken as evidence of the failure of the cells to properly neutralize toxic principles. In either case, the patient should not be permitted to consider himself well, nor to depart from those lines along which his improvement has been effected.

DISEASES OF THE THYROID AND THYMUS GLANDS, MYXŒDEMA, CRETINISM, GRAVES' DISEASE, AND OBESITY.

By S. J. MELTZER, M.D.

DISEASES OF THE THYROID; DEGENERATION OR ATROPHY OF THE THYROID GLAND.

Historical Sketch.—Of late our knowledge of the importance of the thyroid to the normal metabolism of the animal body has attained a considerable increase. While there are still some text-books in use, published within the last ten years, in which atrophy of the thyroid is not even mentioned; and while only a short time ago experiments were quoted showing that the removal of the thyroid does not affect the condition of the animal in any respect (A. Bardeleben[1]), and though clinical medicine did not record any symptom which would indicate the absence or atrophy of the thyroid in the human being: we possess at present abundant proofs furnished by modern surgery and experimental physiology that the presence of the thyroid is essential to the life and health of man and animals. Clinical medicine can present well-characterized diseases which have their origin solely in the atrophy or absence of the thyroid gland; and diseases which for a short period appeared to be hopelessly incurable can now be treated with infallible success. And still more: we recognize in the thyroid gland itself a therapeutic agent of great value and manifold use. The history of this entire chapter is exceedingly instructive, and I shall attempt to give a short outline of it.

In 1873, William Gull[2] read a paper before the Clinical Society of London on "A Cretinoid State supervening in Adult Life of Women." He has given a clear description of a few cases with peculiar symptoms reminding one of cretinism. In 1878, W. Ord[3] read a communication on "Myxœdema, a Term Proposed to be Applied to an Essential Condition in the Cretinoid Affection occasionally Observed in Middle-aged Women." The cases described by Ord were similar to those described by Gull. One of these cases came to

a post-mortem examination. The jelly-like swelling of the connective tissue suggested the term myxœdema. The tissue of the thyroid gland was found to be entirely replaced by fibrous degeneration. Soon after similar reports appeared in the medical literature of other countries also. Charcot [4] named this condition *cachexie pachydermique*. In the few cases which came to an autopsy the thyroid was invariably found to be degenerated.

On September 13, 1882, in a communication made before the Medical Society of Geneva, Switzerland, J. Reverdin [5] reported that patients whose entire goitrous thyroid was removed soon show a peculiar condition. About seven months later, on April 4, 1883, Kocher [6] of Berne read his classical paper on cachectic conditions following the total removal of the goitrous gland, to which condition Kocher gave the name of *cachexia strumipriva*. At that time Kocher did not think that the cachectic condition was due to the loss of the function of the thyroid. On May 15th J. and A. Reverdin [7] published an article on myxœdema following extirpation of the thyroid. These authors took the ground that the complex of symptoms following the total extirpation of the thyroid gland is simply myxœdema—*operative myxœdema*—and suggested the idea that both forms, myxœdema and cachexia strumipriva, are due to the loss of the function of the thyroid gland. In October of the same year, at a meeting of the Clinical Society of London, Felix Semon [8] made the further suggestion that the loss of the function of the thyroid is probably the cause of all the three states: cretinism, myxœdema, and cachexia strumipriva. At this meeting a committee was appointed to investigate the entire question.

Soon after the communication of Reverdin became known, it was recalled that M. Schiff [9] had reported as early as 1859 that the removal of the thyroid in dogs was followed by a general tetanic condition of the animal. These experiments were for more than twenty years entirely ignored. Schiff [10] repeated them again and confirmed his former results. This time the statement brought out quite a large number of experimental investigations, with the usual course: some investigators denying the facts, others admitting them, but explaining them by some fault in the technique, etc. Finally all the opposition was overcome, due especially to the excellent works of Ferdinand Fuhr [11] and Victor Horsley.[12] The committee of the Clinical Society reported its prolonged and thorough investigation in 1887,[13] and by the weight of this report, as well as by the many important contributions coming from many independent sources, the following conclusion was practically settled:

The thyroid gland exerts an important function in the body of man and animals. When a child is born without a gland, or the

gland becomes degenerated spontaneously during infancy or childhood, a state of cretinism develops. If the degeneration occurs in adults, the result is myxœdema. The same results are obtained in man when the thyroid is totally removed by operation. The removal of the gland in animals brings on an acute tetanic outbreak, a condition which occasionally occurs also in man.[14] The difference between man and animals is probably due to the fact that in animals a healthy thyroid is removed, while in man the operation usually removes the goitrous thyroid and the body was already adapted to a moderate impairment of the function of the gland.

Later experimental investigations have cleared up many former experimental failures. Some accessory glands which are scattered all over the neck and in the chest or even within the trachea were not removed. These remnants become hypertrophied after the removal of the main gland, and assume its function. When these accessory glands or parathyroids are also removed, the *cachexia thyreopriva* can be produced even in rodents.

Of the American contributors to the literature of our subject, the treatise of Hun and Prudden[15] deserves special mention, as it ranks high among the writings on myxœdema and is largely quoted by subsequent writers. We should also record the statement made by Hansleutner[1] about Rush, reporting the observation that the total removal of the thyroid gland exerts a striking influence upon the brain.

While thus the etiology and symptomatology of the new diseases were brought to a finish, their treatment seemed to be in a hopeless state. Pilocarpine, arsenic, strychnine, and other drugs and therapeutic measures were recommended and employed; but nobody could report a permanent improvement, not to speak of a cure. However, the experimental study of the function of the gland soon brought forth a new plan of treatment.

Schiff reported (1884) that the implantation of a thyroid in the peritoneal cavity of the dog alleviates the results of the removal of the thyroid from the neck of this animal. Kocher soon tried this method in the human cases of cachexia strumipriva, but did not obtain any improvement. Von Eiselsberg,[16] however (1889), who confirmed the statement of Schiff, and Bircher[17] (1889) succeeded in alleviating all the symptoms of cachexia, once for three months and once for nine months, in a case of operative myxœdema with tetany, by implanting a human thyroid in the abdomen of this patient. Independent of the attempts of Kocher and Bircher, Horsley[18] (1890) advocated this method for the treatment of myxœdema and cretinism. The advice was followed out by many surgeons by burying the thyroid of a sheep either in the abdominal cavity or in some

[1] *Archiv für prakt. Medizin*, 1810.

place in the subcutaneous tissue. There resulted a decided improvement in all cases treated by this method, but in all cases sooner or later a recurrence of the symptoms took place. The expectation that the gland would vascularize and discharge its function in the new place was not realized; the gland becomes absorbed.

Bettancourt and Serrane [19] noticed the improvement on the second day after the grafting of the thyroid; this could only mean that the absorption of some of the juice within the grafted thyroid caused the beneficial influence. Furthermore, Vassale [20] (1890) observed the cachexia in dogs obviated by intravenous injection of an extract of the thyroid gland. A similar statement was made by Pisenti.[21] Thus the road was paved to the idea that the juice of the thyroid extract introduced into some place in the body could obviate the effects of the loss of the thyroid gland.

George R. Murray, in February, 1891,[22] made the suggestion to treat myxœdema by subcutaneous injections of an extract of the thyroid. In the following April [23] he himself instituted this plan of treatment, and in July, 1891, he presented to the British Medical Association a case of myxœdema remarkably improved by this new mode of treatment.

The most important step was made by Howitz [24] of Copenhagen, who in June, 1892, reported that he obtained a curative effect upon myxœdema by the administration by the mouth of the raw or cooked thyroid. Similar statements were made by Mackenzie [25] and by Fox [26] in October, 1892. The treatment was soon applied also to cretinism and operative myxœdema, with equally good results. A further practical advance was made by converting the thyroid into more convenient forms of administration: extracts, powders, tablets of the thyroid, became handy therapeutical agents which got into general use all over the world with uniformly good success.

The combined efforts of physiology, medicine, and surgery have, then, established the fact that in the absence of the thyroid gland a detrimental factor is rapidly developing within the body which causes the myxœdematous cachexia, and that the thyroid gland furnished another factor which, when introduced into the body, either by natural or artificial ways, neutralizes the detrimental effects of the opposite factor. What these factors are, and how and where they are produced, have been all along only a matter of speculation. In the last two years, however, those speculations have reached at least an experimental state, and some important points have been brought to light.

Notkin [27] succeeded in separating an albuminous, chemically well-defined, substance which when injected into animals produces symptoms somewhat similar to the cachexia strumipriva. This substance he has termed "thyroprotein," and believes it to be the deleterious

factor which produces the cachexia accompanying absence of the thyroid. The opposing factor Notkin believed to be an enzyme or a ferment.

In conformity with this view S. Fränkel[28] reports that he succeeded in separating from the thyroid an albuminous crystallizing substance which possesses the power to neutralize the cachexia strumipriva. To this substance Fränkel has given the name of "thyreo-antitoxin." A similar result was obtained by Drechsel,[37] a well-known authority on physiological chemistry, and it seems that Fränkel and Drechsel had partly identical substances in their hands which would speak for the validity of their statement.

E. Baumann,[29] however, in the fall of 1895, made the very important discovery that the thyroid gland contains iodine. He succeeded in separating from the gland a substance which contains all the iodine in an organic combination. To this substance Baumann originally gave the name "thyreo-iodine," but it is now in the market under the name of "iodothyrine." As the iodothyrine is not an albuminous substance it has certainly nothing to do with the thyreo-antitoxin of Fränkel; nevertheless Baumann claims that his products contain the entire effective principle of the thyroid gland.

It is now, then, an established fact, that the absence, atrophy, or progressive degeneration of the thyroid gland is the sole cause of myxœdema, a well-defined, newly recognized disease; of cretinism, an old well-known pathological condition, and of cachexia strumipriva, an offspring of modern surgery. Before entering upon a detailed presentation of the treatment of these diseases we shall proceed with a brief description of their symptoms.

Myxœdema.

Myxœdema is a disease of the adult, of idiopathic origin. Though occurring at all ages, the years between thirty-five and forty-five show the greatest number of cases. It occurs more frequently in women than in men (six to one). It has been seen nearly all over the world, but in some places more than in others. With regard to the exciting cause we have as yet no definite knowledge. There is in literature one case which was caused by syphilis,[30] another case by actinomycosis,[31] a few others were caused by the misuse of iodine (Mosler, Anderson, etc.), in a few cases Graves' disease preceded myxœdema (Baldwin, Bramwell, etc.), and in a few others there was a distinct hereditary predisposition (Ord, Hun and Prudden, etc.); for the vast majority of the cases, however, we have to state that the disease was of idiopathic origin.

The disease is recognizable at sight by the peculiar œdema and by

the "cretinoid" appearance (see Fig. 26). The œdema is solid, does not pit on pressure, and is not distributed according to the laws of gravity. The œdema of both lids, of the nose, of the lips, and of the supraclavicular region is most striking. The skin is dry, scaly,

FIG. 26.

Myxœdema. Mrs. N., Nov. 22, 1893.

and has a yellowish, waxy appearance. There are two bluish-red points on the cheeks, the everted lips are cyanotic, the gums spongy and bleeding easily. The hair on the head, axillæ, etc., is dry, faded, thin, and scanty, the nails are grooved and brittle. Temperature and pulse are below normal. The patient always feels cold and never perspires. The urine is rather scanty and generally contains some albumin. The bowels are constipated. The general movements are awkward and slow; so also is the speech. The mental capacity is affected, memory impaired, and hallucinations are quite a constant occurrence. There have been cases with real insanity.

The diagnosis should offer no difficulty. The character and the distribution of the œdema, the constant sensation of cold, and the total absence of perspiration will sufficiently distinguish it from Bright's disease and obesity, the only pathological conditions with which myxœdema could be confounded.

Cachexia Strumipriva.

Since the considerable progress which the surgery of the thyroid gland has made within the last twenty-five years, the total extirpation of the goitrous or otherwise affected thyroid has been often resorted to. In the surviving cases a state of cachexia was gradually developed which is in every respect similar to the cachexia of the idiopathic myxœdema. In some cases the cachexia is preceded by tetanic fits, which usually set in soon after the operation. The onset of the cachectic condition took place after a few weeks or even after a few months. In some cases the cachectic symptoms disappeared again after a few months' duration, on account of some normal gland-tissue which was left unintentionally, and which within these few months became hypertrophied, thus becoming enabled to provide the body with the necessary amount of thyroid secretion. When the cachexia strumipriva reaches its full development there is present, then, no special feature enabling us to distinguish this cachectic state from the idiopathic myxœdema.

Cretinism.

There is an endemic and a sporadic cretinism. The former occurs in greater frequency, but is mostly confined to certain localities—to "goitrous districts;" the latter is less frequent, but is to be found in all parts of the world. The sporadic cretinism has no thyroid. In the endemic cretinism the gland is often rather hypertrophic, goitrous; the microscopic examination of these glands, however, has revealed a total degeneration of the follicular tissue. We take the stand that all forms of cretinism are the outcome of an infantile myxœdema; this might be congenital, or the onset might occur at any period between birth and puberty. If we now state that in addition to the œdema and the nervous symptoms seen in myxœdema of the adult the infantile myxœdema causes the arrest of the bodily and mental growth, we can easily understand that the symptoms will vary according to the period at which the onset took place. Contrasted with the very short body of the cretin, the œdema of neck, stomach, etc. appears to be enormous. The broad and retreating nose, the retreating and narrow forehead, the very small gazeless eyes, the thick lips, and the protruding tongue present a beastly expression that, once seen, is never to be forgotten. The intellectual faculties are sometimes far beneath those of the beast. No speech, no understanding, no recognition, and sometimes no perception whatsoever—an absolute intellectual blank. It is not my task here to give a detailed description. The symptoms of the disease are multiform, but the diagnosis offers no difficulty; the characteristic œdema will distinguish it from idiotism, and there is no other disease which could be confounded with cretinism.

Treatment.

There are on record a few cases of these diseases for which it is claimed that they improved without any treatment. Of the post-operative cachexia we have mentioned above it is said that in some cases the symptoms disappeared after a few months; that is, the accessory gland or the hypertrophied remnant of the normal gland-tissue, accidentally left over, attained a growth sufficient to take the place of the main part of the gland which had been removed. This is a very important consideration. We might assume that a thyroiditis or other pathological process affects now and then the greater part of the thyroid, so as to cause the development of symptoms of cachexia; after some time, however, either the process subsides and the thyroid attains its growth again throughout, or else the unaffected part becomes hypertrophied to a degree sufficient to provide the body with the necessary principle. Accordingly, one would think that spontaneous recovery should be possible even in so-called idiopathic myxœdema, especially in its undeveloped stages, of which as yet we know so little, and which may occur more often than we know at present. The case of myxœdema which was caused by syphilis was cured by anti-syphilitic treatment. The case which was complicated by actinomycosis of the thyroid improved after removal of the infected part. Tetanic attacks are often alleviated by sweating. Myxœdematous patients feel better in summer and in a warmer climate than in winter and in a cooler region. Pregnancy has a favorable influence upon myxœdema; the myxœdematous condition, however, seems to prevent conception. Here may be mentioned also a method of surgical treatment of the thyroid devised by Poncet.[1] He exposes both thyroid lobes, dusts them with iodoform, or introduces pieces of ivory in order to increase the secretion of the thyroid. The inventor of this method terms it *exo-thyréopexie*, and claims to have attained a wonderful result by the application of this method in a case of infantile myxœdema. As yet this statement has not been confirmed by anyone else; no judgment, therefore, can be passed upon its value.

The Thyroid Treatment.—The vast majority of all the cases reported in the medical literature were not improved until the thyroid treatment was instituted, but this therapeutic measure has indeed accomplished wonders.

The thyroid was employed as a therapeutic agent in five different ways: 1. The implantation of a thyroid from sheep or monkey (or human being) in the abdominal cavity or in the subcutaneous tissue of the patient; 2. The subcutaneous injection of an extract of the thyroid; 3. The administration of the thyroid or its preparations by

[1] *Lyon médicale*, April, 1893.

the mouth; 4. The administration of an extract of the thyroid by the rectum (Leichtenstern); 5. The inunction of a thyroid-lanolin cream (Menzies).

Since more convenient methods of administration of the thyroid were established, grafting has been given up entirely. The implanted thyroid sooner or later became absorbed, and the operation did not offer any advantage over the other more harmless methods of incorporating thyroid juice in the cachectic body. Of course, the grafting would accomplish an ideal cure if it would lead to a vascularization of the foreign thyroid in its new place, thus assuming permanently the function of the lost gland. Horsley has lately suggested to feed the patient with a thyroid preparation previous to the grafting, in order to implant the gland in a more normal tissue, where it would have a better chance to gain a foothold. As yet the proposition has not been brought to a practical test.

The extract for the subcutaneous injection was prepared with glycerin and the addition of some carbolic acid or thymol. It has often produced abscesses, phlegmon, erysipelas, etc. A striking fact was observed that some cases which did not respond to the subcutaneous treatment have derived, nevertheless, great benefit from the administration of the thyroid by the mouth. The subcutaneous method also has been very little employed within the last few years.

The employment of the rectal and the inunction methods seems to have been entirely restricted to their originators, and we are not in a position to judge whether these methods render any reliable results.

Practically, then, we possess at present only one method of incorporating the thyroid in the body, and that is the administration of the gland or its preparation by the mouth. Of the particulars of this method we shall speak later.

The effect of the thyroid upon myxœdema is a wonderful one (compare Figs. 26, 27, and 28). Twenty-four hours after having taken a small dose of thyroid the patients claim to feel improved. They are in better spirits and do not feel the swelling in their face in the morning on rising. After five or six days everybody can notice that the œdema is commencing to disappear, and the entire behavior of the patient undergoes a change. In a few weeks the change is so complete that often even intimate friends do not recognize the patient again. The most striking feature is, of course, the loss of the œdema, which leads to a considerable reduction of the patient's weight. In my case [32] of myxœdema the loss was nearly 50 lb. (see Fig. 28). The œdema disappears first in the upper part of the body. The skin becomes loose and baggy. With the disappearance of the œdema of the eyelids, the cheeks, the nose, and the lips, the patient loses the "cretinoid" appear-

ance. With the disappearance of the œdema of the neck one can establish the total absence of the thyroid gland. By the reduction in the size of the tongue and by the other changes in the nose, mouth, and throat the voice attains a normal sound. The skin peels off in larger

FIG. 27.

Mrs. N., Jan. 17, 1894, after eight weeks' treatment with thyroid.

FIG. 28.

Mrs. N., Feb. 24, 1894, after three months' treatment with thyroid.

and finer scales, and becomes smooth and soft. It often becomes covered with a fine lanugo which soon disappears again. A crop of fine hair develops on the head, axilla, and pubes. The new hair is mostly of another color than that of the old. The temperature of the patient goes up, the frequency of the pulse increases, the patient feels warm. Perspiration sets in again, and sometimes even becomes profuse. The amount of urine is generally increased; the albumin, if there has been any, is decreased or totally absent. The movements of the bowels become regular. Menstruation and sexual instincts turn into a normal course. The change in the mental condition of the patient is nearly as striking as the external transformation of the body. Instead of the hallucinations, mental sluggishness, and irritability of temper, the patient becomes sound of mind, active, and in good spirits.

All these favorable changes take place also in fully developed cases of *cachexia strumiprica*, when subjected to the thyroid treatment. If the thyroid is administered soon after the total extirpation of a goitre none of the symptoms of cachexia make their appearance. Surgeons

now very rarely remove the entire gland, since the detrimental effect of the total extirpation of the thyroid gland has become known. However, even after leaving a part of the goitrous thyroid, cachexia might develop, as nobody is capable of judging whether the part left contains enough of the normal gland-tissue to meet the requirements of the body.

As to the results of the thyroid treatment of cretinism, the favorable results are also striking, but are not so plain as in the myxœdema of the adult. Besides the favorable effect upon the myxœdematous tissues we observe an unmistakable influence upon the arrested growth, especially the growth of the bones. The influence upon certain symptoms of the nervous system can be noticed quite early. The clonic convulsions and epileptiform fits in my case,[33] which used to appear every few minutes, disappeared twenty-four hours after the first administration of a thyroid preparation. It is also quite certain that the mental faculties are favorably influenced to a remarkable degree; the extent of the improvement, however, varies greatly; while the change in some of the patients is surprisingly complete, there being hardly any difference between them and normal children, we meet with some disappointments in other cases; though, to be sure, they are no longer cretins, yet their mental capacity is not much above idiocy. Even with regard to their external appearance cretins show a greater tendency than myxœdema patients to become bulky again, even during the treatment, by the acquirement of normal adipose tissue.

The brilliant success of the thyroid-therapy has, however, some drawbacks. When the administration of the thyroid is discontinued, all the old symptoms gradually reappear one by one. Therefore, to keep our patients in a healthy state, we must give them all their life long a larger or smaller quantity of thyroid.

Again, the thyroid is by no means a harmless remedy. Overdosing with thyroid produces a number of more or less serious symptoms, the entire complex of which is now known under the term thyroidism. Certain symptoms of a disagreeable, but of a less serious and of a passing character are nearly constant companions of the administration of the thyroid. Ten or fourteen days after the institution of the treatment, even with moderate doses, the patient complains of an occipital headache, of "rheumatic" pains all over the body, of a tremor, and of general weakness. But these ailments are comparatively easy to remedy and usually soon pass by. Sometimes, however, there arise more serious and more persistent complications. Gastric trouble sets in, with persistent vomiting and profuse diarrhœa. Foulis[34] reported the death of a patient due to this condition. There occur sometimes tachycardiac attacks of quite a dangerous nature. The pulse goes up to 140 or even 180, becomes

thready, the patient becomes dyspnœic, feels extremely oppressed, and looks ghastly. Sometimes an increase of the temperature is present. Indeed in a few cases these attacks terminated fatally. However, these fatal results occurred only at an early stage of the new era, before the character of the remedy was well known; at present we no longer hear of such grave occurrences. Finally, some cutaneous disorders of a stubborn and annoying character, like urticaria, erythema, and eczema, have often accompanied the thyroid treatment. Sometimes sugar or albumin appears in the urine. It is probable that many of these symptoms are not to be considered as effects of the curative principle of the thyroid; they do not constitute the symptoms of thyroidism proper. The gland consists of proteid matter in the decomposition of which ptomaïnes and leucomaïnes are found; we may well assume, then, that many of the alarming symptoms are due to the ingestion of these poisonous substances (Lanz,[35] Cunningham[36]). However, it is not to be denied that the effective principle itself might, when given in excess of the necessary neutralization of the element of the cachexia, affect in an abnormal degree the metabolism and the regulation of the nervous system in a manner opposite to the *cachexia thyreopriva*—athyreosis and hyperthyreosis. However this may be, our practical interest centres in these two points: 1. These complications soon disappear after discontinuance of the administration of the thyroid. 2. When the thyroid preparations are carefully selected and the dosage is carefully guarded, most of the untoward symptoms can be well avoided.

The thyroid can be given by the mouth either in the natural state, finely minced, raw, or slightly cooked; or in glycerin-extracts; or the entire thyroid is converted into a dried powder which is dispensed in capsules, tablets, or pills. Or, finally, the gland is reduced by a complicated chemical process to a substance free of albuminous matter, and then thoroughly mixed with sugar of milk, and dispensed in powders, tablets, or capsules—the iodothyrine of Baumann.

The administration of the unprepared thyroid has not been and will not be in extensive use. Even when slightly cooked it remains a disgusting article of food, and a thorough cooking might after all destroy the effective principle of the gland. Besides, if the obtaining of the thyroid from the animal be left to the patients or to the butcher, it will often happen that instead of the thyroid the submaxillary or the thymus gland will be taken; many instances of reported failures have been due to this mistake. However, it must be admitted that the ingestion of the entire fresh gland would be an ideal method, as thus the gland will surely contain all the effective parts of the thyroid without any of its decomposed proteids. The disgusting taste could be partly overcome by advising the patient to wrap the minced gland

in a wafer, a method which I have often resorted to in the use of the thymus gland. The glycerin-extracts of the thyroid have been in use more extensively than the fresh glands, though surely with fewer good reasons. The extracts always contain more or less decomposed albuminous matter, and probably do not contain some good parts of the curative principle which, like the thyreo-iodine of Baumann, for instance, are not soluble in glycerin. The form which has come to be most extensively used is that of the dried and powdered gland dispensed in capsules, tablets, or pills. The success is without doubt due mainly to the convenience with which it can be obtained and dispensed; otherwise this form more than any other contains many decomposed proteids which assert their presence by an odor not to be disguised by a coat of sugar or gelatin. The desiccated powder and the tablet made from it are at present manufactured by many wholesale firms all over the world; we cannot give a full list of the brands. The tablets of Burroughs, Welcome & Co. of London have attained great renown in all parts of the world. Besides these tablets, we have in our own market the powder and tablets of the well-known firm of Parke, Davis & Co. and of Armour & Co. All these preparations are made from the sheep's thyroid, though the thyroids of other animals (ox, calf, swine, etc.) prove to be effective. Each tablet of Burroughs, Welcome & Co. is equal to five grains of the fresh thyroid. Two grains of the powder of Parke, Davis & Co. are equal to five grains of the fresh gland, the average weight of an entire thyroid of a sheep being estimated to be about twenty-four grains. Twelve grains of the powder of Armour & Co. are equal to an entire gland; one tablet contains two grains of their powder. I have obtained favorable results with the preparations of all the three firms, but I have had the best results from the powder of Parke, Davis & Co. and have seen more complications from the products of Armour & Co.; urticaria, for instance, was an early and constant companion to the administration of their powder. However, the accident might have influenced my experience, and I intend neither a special recommendation of the products of the one nor a slight to the products of the other firm.

The treatment should be started with small doses. One capsule (or a part of a tablet) containing powder corresponding to two grains of the fresh gland is sufficient to begin with. For the following few days there might be a daily increase of one grain. When the dose of six or eight grains is reached, it is better not to increase any more for a while and to watch the result achieved by these daily doses. If in a few days no unpleasant symptom makes its appearance, the increase with one grain a day can be resumed, continuing it for three or four days, then to be followed by another and longer intermission. If

the patient is still not showing any untoward symptoms the increase might be again resumed. However, 15 grains a day should be the final maximum even when the patient shows a great tolerance for the remedy. When large doses are given it is better to dispense them in two or three parts than in a single dose. It is true that a single large dose seems to have a more immediate effect than the same amount given several times in smaller doses, but it is the large dose which also brings out the alarming attacks. When occipital headaches, pains in the body, or urticaria set in, the increase should be discontinued and a decrease of two or three grains in the daily dose should be made. Phenacetin will remedy the headache, salicylate of sodium relieves the general pains, and a few small doses of pilocarpine drive away the urticaria. If, however, more serious symptoms appear, if the vomiting or diarrhœa or a very frequent pulse set in, the administration of the thyroid must be at once discontinued, the patient put to bed, and the individual symptoms as well as the general constitutional condition of the patient should be carefully watched and treated. The intermission should last at least eight to ten days, and when the treatment is again resumed the patient must be kept on only small doses of the thyroid for the next two or three weeks.

When the patient is undergoing an energetic thyroid treatment the diet should consist mainly of milk and vegetables; a meat diet seems to facilitate the outbreak of the more dangerous symptoms of thyroidism. The patient should be also guarded against too much exertion, and should be given iron and strychnine, of the latter $\frac{1}{20}$ of a grain three times a day.

If the thyroid treatment be carried out with conservatism, patience, and caution, no unfavorable effects are to be feared, and the good results are sure to come.

It was stated above that to maintain our athyreotic patients in a favorable condition they have continually to be treated by the administration of the thyroid. We must, however, distinguish between the treatment required to combat the myxœdematous cachexia already present and that adopted for the purpose of preventing a recurrence of cachexia. As soon as the condition of our patient is reduced to a state which would seem to be about normal the large doses of the thyroid are to be discontinued. All agree upon this, and also upon the further fact that the patient requires a continual after-treatment with smaller doses of thyroid. But there are as yet no definite rules as to how to proceed with these small doses. Some writers seem inclined to continue giving very small doses every day—just an imitation of the normal function of the thyroid; others give a somewhat larger dose once in three or four days; some give once a week, and some others speak even of once in a few weeks. In fact, while we have

quite numerous detailed reports of success in the treatment of myxœdema, we have very few reports telling us of the further course the disease has taken during a longer period after a "cure" has been effected.

The statement which I am going to make here is mainly derived from my own experience: No matter which method we may employ, it will not prevent the earlier or later reappearance of well-marked symptoms of the cachexia. If small doses are given daily the recurrence comes quite early; soon the doses are to be increased, and the increase is to be kept on until a period is reached when even such doses as were maximum at the initial treatment are not sufficient to exert the desired influence. When a larger dose is given once a week the recurrence of pronounced symptoms is distinctly delayed, but only delayed, the recurrence is bound to come, and what is worse, the preparation we employ fails to produce any further effect.

After some experimenting I adopted the following procedure: At first I give a dose of 10 to 12 grains once or twice a week for three or four weeks. Then I discontinue the treatment for some weeks entirely, with the avowed purpose of letting some of the symptoms of the cachexia come on again. Now, even such small doses as 3 grains three times a day are sufficient to reduce within a week most of the unpleasant symptoms. After continuing this treatment for one week more I go back again to once a week, and so on. The increase of weight I do not consider as a symptom of relapse, as some cases after losing their myxœdematous tissue are apt to increase in weight by acquiring healthy adipose tissue. I look upon the sensation of cold and the loss of the ability to perspire as sufficient evidence of the recurring onset of myxœdema.

The recurrence of these symptoms I have seen take place before any of the mental or other disagreeable features set in; the patient, therefore, suffers little by allowing some of the symptoms to reappear. In contrast with the normal function of the thyroid, the body seems to become less responsive to the daily artificial introductions of the thyroid, while susceptibility seems to develop when the body is subjected for some time to the thyroid inanition. In connection with the difficulties thus spoken of the following statement is of practical importance: If a preparation which was employed for some time fails to elicit any further effect, it should be put aside and a preparation from another source should be given, and the success is again assured; later on, the first preparation can again be administered with the original favorable effect. This somewhat surprising statement comes from several independent sources and I can confirm it from my own experience.

Iodothyrine.—About a year ago Eugen Baumann discovered the

presence of iodine in the thyroid gland. It was the first intimation that the body contains iodine in an organic combination, and has shown to us that as yet we do not even know all the elements the animal body contains. Baumann thought at first that the thyroid is the only organ of the body where the iodine is stored up; but he himself soon detected it also in the thymus gland, and Drechsel [37] found it in human hair. With the administration of iodine salt the amount of iodine in the thyroid gland is increased. The presence and the amount of iodine in the gland depends upon whether the food which the animal is fed with contains iodine (sea-fish, plants) or not. The quantity of iodine present in the human thyroid seemed to vary also with the locality in which the person is living. Of the human thyroids which were examined for iodine Baumann found that those coming from the vicinity of Freiburg (goitrous region) contain more iodine than those coming from Berlin or Hamburg. He succeeded in separating the iodine-bearing substance from the gland by a series of chemical procedures. This substance is insoluble in water, alcohol, acids, etc., is free from albuminous matter, and contains phosphoric acid in a very small quantity, while the iodine in this substance amounts to nearly 10 per cent. To this substance the name of "thyreo-iodine" was first given; it is now manufactured on a large scale at the well-known Farben-fabrik of F. Bayer & Co., Elberfeld, Germany, and is in the market under the name of "iodothyrine." The substance is now mixed with sugar of milk and arranged so that 15 grains (1 gramme) of the powder is about equal to 15 grains of the fresh gland and that 15 grains of the powder contain $\frac{1}{200}$ grain (0.3 of a milligramme) of the iodine. Baumann and Roos have tested the effect of this substance upon the cachexia thyreopriva of dogs (and upon human goitres) and obtained the same favorable results as from the feeding of the gland-substance itself. Their statements were confirmed by other experimenters; the dissenting report of Gottlieb [38] cannot be given very much consideration, as it is doubtful whether he had the proper substance in his hands (see, however, the article of Cunningham). The efficacy of iodothyrine has been tested in human beings on cases of myxœdema, goitre, and obesity.

I am not aware of any report of the therapeutic use of iodothyrine in this country. I have used iodothyrine for a few months; the results are satisfactory, indeed, but they differ in some respects from those seen after the administration of the gland-substance itself. After permitting a myxœdema patient to develop distinct cachectic symptoms, including mental manifestations and development of some myxœdematous tissue, I placed her upon the treatment with iodothyrine. I started with 5 grains three times a day and had it increased within two weeks to 30 grains a day. All the symptoms of

the cachexia gradually subsided, but the improvement took place quite slowly, much slower than when administering any of the other preparations. As stated above, 15 grains of iodothyrine are about equal to 15 grains of fresh gland. When I administered from the other preparations the quantity equal to 15 grains of the fresh gland, the subsidence of the symptoms went on quite rapidly and was more pronounced than after giving for some time 30 grains a day of iodothyrine. But, on the other hand, with the other preparations I hardly ever could overstep the limit of 15 grains without being halted by serious complications; with the iodothyrine, however, even after taking 30 grains a day for a number of weeks the patient did not experience any unpleasant symptoms whatsoever.

Baumann claims that iodothyrine contains the entire anti-cachectic principle which is present in the entire gland, and ignores the statements of S. Fränkel with regard to the importance of his thyreo-antitoxin. There are, however, sufficient reasons to disagree with this view of Baumann's. Drechsel, also a well-known authority on physiological chemistry, reports that he has succeeded in separating two distinct albuminous substances which prove to be efficacious upon thyroidectomized dogs. One of these substances is apparently identical with Fränkel's thyreo-antitoxin. Drechsel believes that there must be at least three different substances in the thyroid gland, all of which have more or less the same anti-cachectic influences (compare also the article of Cunningham). A striking point against Baumann's view is the fact that curative results were obtained by alcoholic and glycerin extracts. As iodothyrine is insoluble in alcohol and glycerin, these extracts did not contain Baumann's substance, nevertheless it is just these extracts which have inaugurated the thyroid-therapy.

Finally, I might quote, if I am permitted, my own experience with iodothyrine, which has shown a distinct delay in the effect in comparison with the effects obtained from the preparations coming from the whole gland. It seems to me that there can be no doubt that the iodothyrine represents only a part of the effective substance of the thyroid. Nevertheless I would strongly advocate its employment. It does not contain albuminous matter, it does not contain toxins and ptomaïnes, and it does not decompose at all; even after months there is no odor or any other sign of decomposition. Therefore, perhaps, the iodothyrine does not cause so often those disagreeable symptoms which are unavoidable when the other preparations are used in efficient doses. I have adopted for the present the method of alternating larger doses of iodothyrine with smaller doses of other preparations, thus increasing the efficacy of the treatment without causing any untoward complications. Iodothyrine offers also the advantage of a more rational dosage. While in the other prepara-

tions we are practically unable to judge whether a certain quantity contains much or nothing of the effective principle, we know, when we dispense iodothyrine, exactly how much iodine we administer, and it is at least a plausible hypothesis to assume that the effective principle in the iodothyrine is in proportion to the amount of iodine present. Taken all in all, iodothyrine marks a considerable practical progress in the therapeutics of the thyroids. The only trouble with this preparation, at least for the present, is its high price.

Goitre.

The hypertrophy, or more correctly the enlargement, of the thyroid gland is termed goitre. This diseased condition is either congenital or acquired. In the latter case the development is either acute or chronic. We have to distinguish between sporadic and endemic goitre. Sporadic cases of goitre are evenly distributed all over the world, but they are comparatively rare. The endemic goitre is confined to certain regions, of which the central Alps in Europe are a striking example. In the goitrous districts which are to be found in all parts of the world this disease is quite of frequent occurrence, and plays quite an important part in the life of the population. There are on record also epidemics of goitres occurring even in regions where the goitre is not endemic.

Mechanical effects have something to do with the causation of the sporadic goitre. It develops during pregnancy or parturition, it may come after trauma, the development is influenced by all movements which produce hyperæmia of the thyroid: constant work with the head down, cornet-playing, etc., emphysema, valvular heart trouble, etc.; but it is very doubtful, to say the least, whether these mechanical factors are the sole cause of the development even of the sporadic goitre.

As to the origin of the endemic goitre many theories have been advanced. St. Lager[39] enumerated more than forty. There seems to be at present unanimity of opinion on one point—namely, that the drinking-water contains the evil factor. There is quite a divergence of opinion, however, as to what this factor may be. Some connect it with the difference in the geological strata with which the water comes in contact; some accuse the presence, some the absence, of certain inorganic substances in the water. Others think of organic substances, and still others of specific germs, of bacteria. We mention these theories inasmuch as they have some bearing upon certain prophylactic measures.

Goitre occurs in women more frequently than in men. Heredity is a recognized factor. The goitre is either unilateral, when mostly the right lobe is affected, or it extends over both lobes; it also starts

sometimes from the isthmus. Usually it is located in front of the neck; in some cases, however, the location of the goitre is subclavicular or substernal, or it is wandering—*i. e.* it is sometimes within and sometimes outside of the anterior mediastinum. The goitre can also sometimes be submaxillar, retro-pharyngeal, or retro-tracheal.

With regard to the differences in the structure of the enlarged thyroid gland, the goitre is divided into many forms, the knowledge of which is of practical importance. In a parenchymatous or follicular goitre the enlargement is due to the increase in the number of the follicles. If the follicles themselves are degenerated and contain a large amount of colloid, the enlargement is termed colloid goitre. In a cystic goitre the walls between many enlarged follicles are atrophied, and the follicles form together one large cyst which may contain colloid material, serum, or blood. A cystic goitre may contain one or many such cysts. The hypertrophy of the interglandular connective tissue is the pathological basis of a fibrous goitre. Finally, in a vascular goitre the blood-vessels are dilated. In many cases all of these changes are to be found in one and the same goitre. In many cases of goitre the course is slow and the patients are but little affected by the disease. In other cases, however, the goitre is the source of serious troubles, and the patient is constantly in danger. The pressure upon the soft trachea and upon the recurrent laryngeal nerves causes chronic dyspnœa and sometimes sudden asphyxia and death; the pressure upon the sympathetic often causes headache, and the pressure upon the pneumogastric or accelerating nerves causes tachycardia and palpitation.

Treatment.

Children of goitrous parents should be removed from the goitrous district. The same applies to the goitrous people themselves, as there are cases on record where goitre disappeared after the patients removed to another locality. Even entire epidemics were suppressed by this method (see Ewald). Improvements in the general sanitary condition have a favorable prophylactic effect upon the development of the goitre. The hygienic condition of the individual has also something to do with the acquisition of the goitre. The water should be filtered and boiled, or, still better, rain-water or water conducted from another non-goitrous region should be used.

Acute sporadic cases often disappear spontaneously without further treatment.

The treatment of goitre can be either medical or surgical. The medical treatment consists in external applications, in intraglandular injections, and in internal administration of medicines. The drug which hitherto has been mostly employed and has given the most

satisfactory results is iodine. For external applications on the goitre have been used either the plain tincture, or iodine and potassium iodide in solution (iodine 1, potassium iodide 5, water 100), or iodide of potassium or iodoform-salve with lanolin. Also mercurial preparations have been employed for external use. There are many statements with regard to favorable results achieved by this method. Personally, I have seen no influence whatsoever from these external applications. We might mention here also the claim that cataphoresis (with iodine) effected a cure; also that the galvanic current (60 milliampères) is recommended in goitre.

The intraglandular injections are made by first inserting the needle of a hypodermic syringe, and when blood is not coming the syringe is attached and the fluid injected, thus preventing the dangerous injection into a blood-vessel. Tincture of iodine is mostly employed: 10 to 15 drops every few days until ten to twenty injections are made. Good results were obtained in parenchymatous goitres; some claim a certain improvement also for fibrous and cystic goitres. There is a positive contraindication to employing this method in colloid and vascular goitres. Mosetig v. Moorhof recommended iodoform (iodoform 1, ether 5, olive oil 9; the mixture not to be exposed to sunlight). Injections were also made with perchloride of iron, alcohol, Fowler's solution, osmic acid, ergotin, carbolic acid, etc. It seems to be the general opinion that all these remedies are not by any means so effective as iodine, and on the other hand are a good deal more dangerous. We must state, however, that there are on record about thirty deaths following the injection of iodine into the goitrous mass. In view of this fact, and in view of the fact that we now possess remedies and methods at least as reliable as the intraglandular injection, this method should be entirely discarded.

Administration of potassium iodide internally has unquestionably accomplished in very many cases a reduction of the goitre; 10 to 15 grains a day is a sufficient dose. Also other preparations of iodine were given, like iodide of iron, iodoform ($\frac{2}{3}$ of a grain three times a day in pills), spongia usta, etc. However, the administration of iodine has also a drawback. It sometimes produces a complex of symptoms which has been termed *iodism*. The patient became thinner, had palpitation, felt sick, and sometimes even had fever. These symptoms used to appear soon after taking small doses, when there was a rapid decrease in the goitre. There is at present a general inclination to consider iodism as a sort of cachexia strumipriva, under the assumption that the iodine has reduced also the normal gland to an ineffective minimum. It seems to me, however, that the symptoms of iodism remind one rather of Graves' disease than of myxœdema. We should note here that according to Woakes [40] hydro-

fluoric acid (20 to 25 minims of a $\frac{1}{2}$ per cent. solution) has proven to be very effective even in cases which did not respond to the treatment with iodine.

The Treatment of Goitre by Thyroid.—While studying the effect of thyroid-feeding upon insanity, Reinhold [41] made the accidental observation that in goitrous patients during the administration of the thyroid the goitre became distinctly smaller. Soon after, Bruns [42] started a systematic treatment of the goitre with thyroid and obtained very favorable results. There are already numerous reports confirming the statements of Reinhold and Bruns, and the successful treatment of goitre with the thyroid gland can safely be considered as a well-founded fact. From my personal experience I would say that the treatment of the goitre with products of the thyroid brings about decidedly better results than the treatment with iodine. The method of administration is the same as in myxœdema, only that the increase in the doses can be pushed much farther and more rapidly. There is a limit to the administration of the thyroid, also, in the treatment of goitre—large doses will finally produce thyroidism; but goitrous persons seem to stand the ingestion of thyroid better than do myxœdematous patients, also the symptoms seem not to become so grave, and they disappear soon after the discontinuation of the thyroid-feeding. The goitre seems to share, however, the fate of myxœdema as far the relapse is concerned. There are so far only a few cases on record with an absolute cure, and besides the period of observation is as yet too short to enable us to form a positive opinion. The form of enlarged gland which benefits mostly by the thyroid treatment is the parenchymatous goitre; however, even the fibrous, colloid, and cystic goitres benefit greatly by the treatment, inasmuch as nearly all the goitres contain some soft tissue which is absorbed and by which the goitre becomes smaller and the adenomata or cysts become more distinct and more amenable to surgical treatment. The subjective symptoms, especially the dyspnœa, seem to improve soon after the administration of one or two doses and long before the decrease of the goitre can be noticed. I can further report that iodothyrine also effects a reduction in the size of the goitre; but here, too, as in myxœdema, the effect is much slower than the one produced by the ingestion of the preparations which contain the substance of the entire gland.

Treatment of Goitre by the Thymus Gland.—Mikulicz [43] has reported that the use of the thymus gland produced similar results to those attained by using the thyroid gland. His experience was derived from the treatment of 10 cases. Reinbach [44] has followed him with a report of 30 cases, 20 of which were positively improved. The improvement is just as marked as that effected by the treatment

with thyroid, and in some cases the thymus brought relief where the previous treatment with thyroid did not yield any result. The main advantage of the administration of the thymus gland consists, however, in the fact that it can be given in large doses and for a long time without producing any untoward symptom. I can emphatically confirm this statement, as a patient of mine has been taking large doses of raw thymus from the lamb every day for the last year without having any unpleasant symptom whatever. Mikulicz and Reinbach employ mostly fresh, raw glands finely minced. They start with 10 to 15 grammes ($\frac{1}{2}$ to $\frac{2}{3}$ oz.) three times a week, and increase the dose even to 30 grammes (1 oz.), though they do not believe that the larger doses effect better results. There are already in the market tabloids of thymus. There is less trouble in obtaining fresh thymus than thyroid glands, as the butchers well know the former and do not know the latter.

The surgical treatment of the goitre lies outside of the scope of this chapter, and we shall therefore restrict our reference to this method of treatment to only a few remarks. Excision of the entire gland is not now practised; usually about one-fourth is left in order to prevent the development of the post-operative myxœdema. This part, however, might not contain sufficient normal tissue, and it is therefore advisable to start with some thyroid-feeding in order to prevent a possible tetanic outbreak. Thyroid-feeding should also precede the operation, for the purpose of bringing out more clearly the cysts or adenomata. Angerer, however, believes that this previous feeding with thyroid was the cause of a death which soon followed the thyroidectomy, the assumption being made that the thyroid-feeding had a weakening influence upon the heart. There cannot be such an objection to the administration of the thymus, if the statements of Mikulicz and Reinbach are generally confirmed.

There are at present many operative measures which have their indications according to the special requirements: Division of the isthmus to relieve tracheal pressure; incision and drainage of cysts; enucleation of cysts, adenomata, etc.; partial resection of fibrous goitres, and the ligation of the thyroid arteries, especially in vascular goitres. Ligation of all the arteries is not, however, now practised, as it is found to produce a cachexia similar to that which appears after total removal of the goitrous gland.

Modern, progressive surgery devised and developed all these fine operative methods before we had at our disposal the new era of the successful medical treatment. How often we may still have to resort to operative treatment, when dealing with emergencies arising from the goitre, the future will teach us.

Other diseases of the thyroid and their treatment do not require an extensive description.

Hyperæmia occurs during menstruation, pregnancy, parturition, or may be due to any pathological course which offers a resistance to the return of the venous blood from the neck (mediastinal tumor, valvular heart trouble, emphysema). The treatment is directed as far as possible against the primary cause. Some simple hygienic measures, like the avoidance of a tight corset, a tight collar, of sitting with the head bent forward, of climbing stairs, mountains, etc., are all that can be advised.

Thyroiditis is an inflammation of the thyroid which is either idiopathic or occurs as a sequel or complication or metastasis of many infectious diseases. It occurs also and even more often in a goitrous thyroid; it is then termed strumitis. There is a large, painful swelling over the region of the thyroid, and this is often accompanied by high fever and with chills. It lasts between a few days and a few weeks. The swelling either resolves or it forms one or more abscesses which, when left to themselves, will find their way either outside or into the mediastinum, trachea, etc. The treatment should consist, at least at the beginning, in cold applications in any form; perhaps leeches to the jugular region, inunction of iodoform-salve, and thorough evacuation of the bowels. Exploration with the aspirating needle has to be practised early, in order to detect the formation of an abscess, which must be evacuated and treated in accordance with surgical principles.

Tuberculosis of the thyroid gland is mostly secondary; its treatment is that of tuberculosis in general.

Syphilis of the thyroid is very rare; in one case it gave rise to development of myxœdema, which was subsequently cured by antisyphilitic treatment.

Echinococcus of the thyroid is also quite rare; it might be taken for a cystic goitre, but the aspiration will clear up the diagnosis. The treatment is incision and drainage or enucleation, if possible.

Actinomycosis of the thyroid occurred in one case. There have been symptoms of myxœdema; the patient was cured by the resection of the infected part.

Sarcoma of the thyroid is more rare than *carcinoma;* both are met more often in goitrous regions and occur also more often in a goitrous than in a normal thyroid gland. It might be difficult to distinguish between a benign goitre and a malignant tumor. The goitre displaces the large blood-vessels; the malignant tumor embraces them, is adherent to the skin, and forms metastases in the neighboring lymphatic glands. In a case described by Treupel[45] the absence of the effect of iodothyrine upon the swelling was em-

ployed as a means for differential diagnosis. The treatment is quite hopeless. The operative removal is very difficult and the results are usually bad. Under these circumstances a trial should be given to the toxins of the erysipelococcus (Coley [46]) or to the cancer-serum of Emmerich [47] and Scholl or of Richet and Héricourt.[48]

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We refer also to Cunningham's article on "Experimental Thyroidism" in the *Journal of Experimental Medicine*, vol. ii.

Graves' or Basedow's Disease.

Exophthalmic goitre was described by Graves[1] in 1835 and by Basedow[2] in 1840. It is an established fact that the disease was seen first by C. H. Parry in 1786, and was described by him in a paper which was published, after his death, in 1825.[3] It would, therefore, be more correct to let the disease be known by the name of Parry—"Parry's disease."

The disease is generally known by its three striking symptoms—tachycardia, goitre, and exophthalmos. The eye shows other symptoms which are more or less peculiar to this disease: 1. The unnatural width of the palpebral fissure and the diminished frequency of the normal blinking: Stellwag's symptom.[4] 2. The upper lid does not follow the downward rotation of the eyeball: Von Graefe's sign.[5] Both signs are early symptoms and are often present before exophthalmos is developed; they are more constant symptoms of Graves' disease than the exophthalmos. 3. The insufficiency of convergence;

a near point cannot be seen with both eyes at once: Moebius' sign.[6] There are sometimes present peculiar rapid vibrations of the eyeballs, and also all degrees of paresis, including complete ophthalmoplegia. The exophthalmos and all the other symptoms are mostly present in both eyes; in some cases, however, only one eye shows the abnormality. The exophthalmos can be of all degrees, and is sometimes, perhaps, so moderate as to be overlooked entirely. In the cases on record in the literature the presence of exophthalmos is noted, as it seems, only in 80 per cent. All authors seem to agree that the exophthalmos is not essential for the diagnosis of Graves' disease.

The goitre, too, is in Graves' disease sometimes only unilateral, and then mostly on the right side. Until lately it was believed that the goitre in this disease was mostly of a vascular type. Recent anatomical investigations, however, have shown that a glandular degeneration is constantly present; F. Mueller[7] found this degeneration of the thyroid in a case of Graves' disease with no goitre. Also the cystic and fibrous forms of goitre are not so rare in this disease. The goitre either appears simultaneously with the symptoms of the disease or it develops later. There are cases where a goitre was present for some time before any of the other symptoms set in. Buschan[8] considers such cases as pseudo-Graves' disease, though they may show all the other symptoms just as well as the "genuine" disease. However, the classification of Buschan is apparently made to satisfy his favorite theory of the nervous origin of the disease. As to the constancy, some authors have distinctly stated that in their cases a goitre was absent. Moebius,[9] however, distrusts this statement; the goitres might have been so small that they were overlooked. Moebius, too, is prompted to his opinion by his advocacy of the thyroid origin of the disease.

With regard to the tachycardia, there is hardly a dissenting voice to the verdict of Charcot:[10] No tachycardia, no Graves' disease. In mild cases the pulse is about 100 per minute; in severe cases it can go up to 140–150 per minute, and sometimes even over 200 per minute. Besides the increase in frequency, the heart-beat is strong; there is palpitation, and this is often the first subjective symptom the patients complain of. There is sometimes present, temporarily or permanently, dilatation of the heart, which leads now and then also to hypertrophy. A systolic murmur is infrequent, and is usually associated with anæmia. Genuine valvular trouble, if present, is only a complication, not an essential part, of Graves' disease. There is a strong pulsation in all the arteries of the body, especially in the carotids and the abdominal aorta. In some cases a thrill can be perceived in the goitre (Fig. 29).

Outside of these cardinal symptoms there are a number of other

symptoms which are met with quite often and are important for the diagnosis of the undeveloped forms of Graves' disease—*formes frustes* —and also for the prognosis of the disease. Charcot and Marie[11] have directed attention to a peculiar tremor which is present in many cases of the disease. It is sometimes confined to one side and even to one of the upper extremities. The tremor is to be distin-

Fig. 29.

Exophthalmic goitre.

guished from certain choreiform movements which are met with in some cases of Graves' disease (Kahler[12]). Diarrhœa is present in about one-half of the cases, and is sometimes the cause of the fatal outcome of the disease. It comes mostly in attacks recurring every few weeks. Vomiting is infrequent, but also quite a serious symptom of the disease. There are present quite a number of vasomotor phenomena. The patient blushes at the slightest provocation; feels a burning heat; has the *tache cérébrale;* urticaria; circumscribed œdema on all parts of the body.

There are many other symptoms: Pigmentation of the skin, reminding one of Addison's disease. Falling out of the hair on the pubes, eyebrows, etc. Profuse perspiration, which is the cause of the lessened resistance of the skin to the galvanic current: Vigouroux' sign (Chvostek,[13] Vigouroux[14]). Elevation of temperature, permanently or temporarily. Glycosuria, polyuria, polydipsia, and bulimia. The breathing capacity is diminished: Bryson's sign. General waste of the body and circumscribed atrophy of muscles; atrophy of the uterus.

Manifold symptoms of nervous origin: Paresis and paralysis of certain groups of muscles, "the giving way of the legs," the irritability of temper, the insomnia, all forms of hysteria, and many forms of insanity.

The disease occurs more often in women than in men (nearly five to one). Some cases have presented a striking history of hereditary influence. Eight children and two generations with Graves' disease in one family (Oesterreicher[15]), also three consecutive generations with this disease (J. Rosenberg[16]). Some sorts of nervous diseases were found to exist in the families of nearly every case of Graves' disease (however, if we look for them we might find the same proportion in the family history of every healthy person). It is claimed that the disease is more frequent along the sea-coast than inland, and that some races are more predisposed than others. As yet, however, there are no statistics for either of these claims. Among the incidental causes of the outbreak of the disease shock and fright seem to take the first place.

The onset is sometimes acute, but mostly gradual; the further course is nearly always chronic. Death occurred in 10–11 per cent. of all the cases, and is due either to some intercurrent accidental disease or to the heart or the intestinal trouble of the disease itself. Some cases have terminated in myxœdema.

The pathological anatomy of the disease is, except perhaps in the thyroid, nearly a blank. Changes in the sympathetic nerve, in the pneumogastric nerves, in the medulla oblongata, were recorded in some cases, but only in the minority and mostly by writers who had a theory to support. Those changes might have been artifacts or might occur even in normal bodies; nobody has studied the subject as yet. It is absolutely certain, however, that these changes are not essential to the pathology of Graves' disease.

There are many theories with regard to the nature and origin of the disease: The sympathetic nerve is paralyzed or is irritated; the pneumogastric nerve is affected; both kinds of nerves are affected; the location is in the medulla oblongata with an anatomical basis, or a simple functional neurosis; the brain-cortex is responsible; it is a form of hysteria.

The theory which stands at present in front of the discussion is that which assumes that Graves' disease is caused by "hyperthyreosis." Graves' disease shows a large number of symptoms which are diametrically opposite to those of myxœdema. This disease is due to the absence of the thyroid function—"athyreosis" or "dysthyreosis"—consequently Graves' disease is due to an abnormal increase of the function of thyroid: hyperthyreosis. Moebius[17] is the originator of this theory, which has many prominent followers also in this country,

like James J. Putnam,[18] M. A. Starr,[19] and F. Kinnicut.[20] Many proofs are now being brought forward in support of this theory: The symptoms of myxœdema disappear when thyroid is administered; however, an overdose of the gland produces "thyroidism"—that is, a complex of symptoms which are similar, so it is claimed, to those present in Graves' disease. It has also been stated that in some cases of thyroidism in man even a goitre made its appearance. Ballet and Enriques[21] reported that they had produced a goitre in a dog by subcutaneous injections of thyroid-extract. The theory itself is quite suggestive; the proofs, however, are not convincing. The statements of Ballet and Enriques have as yet not been confirmed by any other observers (see Cunningham[22]). As to the appearance of a goitre in man after feeding with the thyroid, I know of such a case. The man took large doses of thyroid and lost over forty pounds, and then a small goitre presented itself in the neck—it was there before, but had been covered by large masses of adipose tissue which disappeared by the thyroid-feeding. That is the way in which thyroid-feeding produces a goitre. With regard to the "thyroidism," we must remember that most of the symptoms are surely not due to "hyperthyreosation," but to intoxication from the decomposed proteids (O. Lanz[23]). Iodothyrine, though effective in myxœdema, does not readily produce thyroidism, and real fresh glands immediately cooked and administered, though otherwise effective, do not produce any of the symptoms of thyroidism (Cunningham).

Treatment.

The treatment of Graves' disease is to be considered under four heads, as follows: Hygienic, medicinal, electrical, and surgical treatment.

Hygienic Treatment.—Rest is in Graves' disease an indispensable measure. In acute cases or in acute aggravations in chronic cases the rest must be in bed and absolute. It prevents the progress of the disease and alleviates many of the symptoms. The tremor subsides, the heart-beats lessen in number, and the goitre and exophthalmos become appreciably smaller. During the course of chronic cases it should not be insisted upon that the patients stay in bed or go through the ordeal of a "rest cure," as this rather increases their irritability. They should be advised to rest a few hours every day, to avoid all exertions, prolonged and brisk walks and unnecessary climbing of stairs and heights. This does not apply to the systematic treatment by walking and climbing according to Oertel's method, which has its proper indications in some cardiac troubles, and which also was employed, it is claimed, with success in Graves' disease (Funkel[24]). Mental rest is also an important factor in the hygienic management

of this disease. Excitement of all sorts (including sexual) should be avoided as much as possible.

As to the selection of a place of abode, life in the country is preferable to living in the city; the sea-shore is well recommended by many writers. Mountain air is highly praised by some and warned against by other authors. A moderate altitude is probably beneficial. Many recommend it with the view of having permanent quarters. It seems to me that an occasional change of scenery and places has rather a soothing effect upon the depressed patients; they hope in winter to benefit by the country life in summer, and anticipate in summer the home comforts of the winter.

Balneotherapy is probably not a very important factor in the hygiene of Graves' disease. Chalybeate and acidulous springs are recommended. Schott[25] speaks well of Nauheim, which is now in vogue for some cardiac derangements. Sea-bathing is warned against by many authors, though it has its advocates. I had a sad experience with sea-bathing: A patient of mine with all the characteristics of Graves' disease, especially with strongly pronounced tachycardia and vasomotor disturbances, was stopping at the sea-shore. She was then at her best. One day she experienced an irresistible longing to try a sea-bath, which she had not had for many years. She went into the water against the energetic protestations of her family. She had had her feet in the water only a minute or two when she suddenly fell back dead. However, there are a number of cases on record of the sudden death in water—without submersion—of perfectly healthy individuals. It is claimed that in these cases the persistent thymus gland was found to be considerably swollen.[1]

A much more important factor is the hydrotherapy. The authors are unanimous in the opinion that partial or total wet pack, shower-douche, and other methods of hydrotherapy have proven to be beneficial in many cases of Graves' disease. Of course, the treatment has to be individualized according to the prevailing symptoms, preferring generally the more gentle methods of this therapeutic measure. The effects of the hydrotherapy can be assisted by judicous massage or mild applications of some of the methods of mechano-therapeutics. It is claimed that vibration of the ribs reduces strikingly the pulse-frequency (Winternitz[26]). We might mention here that some authors recommend a mild compression of the goitre or of the exophthalmos by mechanical appliances.

We should not omit to note that, according to some authors (Charcot, Buschan) pregnancy may be counted among the favorable measures in Graves' disease, and they advise its application "if possible."

[1] See Achilles Nordmann, *Corresp. der Schweizer Aerzte*, 1889.

Diet is another important point in the management of Graves' disease. With regard to the tendency to general waste of the body the patient has to be fed well, but with regard to the frequent occurrence of diarrhœa and vomiting the food has to be judiciously selected. Furthermore, the condition of the circulatory system requires the omission of alcoholic beverages, coffee, tea, tobacco, etc. One author went so far as even to deprive patients of mineral waters "because carbon dioxide is an exceedingly strong stimulant for the vasomotor centre." Von Hoesslin[27] reports the cure of a case of long standing by keeping the patient on a vegetable diet. W. H. Thomson[28] recently came out strongly in favor of an exclusive milk diet. This has already been advocated by v. Graefe, Friedreich, and others. Thomson thinks that Graves' disease is a state of auto-infection due to absorption of ptomaïnes from the gastro-intestinal canal. While it is, indeed, a generally acknowledged measure to restrict the meat diet in Graves' disease, the past has shown that the proposition to keep the patients on an exclusive milk diet has not acquired many adherents. However, in cases with gastro-intestinal complications Thomson's plan of treatment should receive a fair trial.

Medicinal Treatment.—Quinine had its day; we do not hear much of it now. Iron in any form was a favored remedy and is still greatly in use; but there are old and new statements to the effect that an aggravation of the symptoms often follows the use of iron. Digitalis is often prescribed, but it seems that in Graves' disease digitalis does not even reduce the number of heart-beats. The effect of strophanthus seems to be considered a little more favorable; at least there are as yet not as many writers denying its effect as is the case with digitalis. I have had no success with either. We should not forget that both drugs often interfere with the digestion. We should also bear in mind that an ice-bag or the application of cold in any other form on the præcordial region has also in Graves' disease an indisputable quieting effect upon the rapidly beating heart, a point upon which there seems to be no division of opinion among the writers. English and American writers praise the good effects of belladonna; it is given by the mouth or applied as a plaster on the præcordium or on the goitre. Potassium iodide is recommended by some authors and discarded by others; it reduces the goitre but increases the number of the heart-beats. It should be remembered that the administration of iodine in goitrous cases sometimes produces "iodism," a state which reminds us a good deal of Graves' disease. Bromides fulfil their mission—the patient becomes more quiet and finds sleep. The following drugs—arsenic, strychnine, picrotoxin, ergot, nitroglycerin, nitrate of silver, etc.—have been recommended by one or another author as useful remedies in Graves' disease. The statements

of the cures which have been effected by all these drugs can only serve as a proof that Graves' disease often gets better not only without but even in spite of certain treatments.

W. H. Thomson (see above) lays stress on the unremitting use of what he calls intestinal antiseptics. Two grains of calomel about once a week and the frequent use of phenol bismuth, naphthol bismuth, bismuth subcarbonate or salicylate, salol, ichthyol, etc. Of course, this is in conformity with his theory that Graves' disease is an auto-infection of intestinal origin.

Kocher[29] has lately introduced a remedy in the treatment of Graves' disease which was suggested to him by v. Trachewsky. It is the plain sodium phosphate given in quite large doses (2–10 grammes daily). Sahli and Kocher have obtained good results with this remedy; so have also Edes,[30] Starr,[19] and Moebius.[31] I shall verbally quote the latter's statement; it is quite instructive: "The inventor assumed that goitre in Graves' disease is caused by a diseased condition of the medulla oblongata. Semmola recommended sodium phosphate for diabetes: diabetes is a disease of the medulla: consequently, etc. In spite of this strange deduction I made up my mind to test this remedy, and to my astonishment the patients were well satisfied with it; they slept better and became quieter. Some thought they liked the new remedy better than the bromide powders." This shows that even poor theories are capable of bringing out useful facts.

The effects of the thyroid upon Graves' disease were tried in a good many cases. The majority of the writers state that it has a deleterious effect; but there are some authors who claim to have seen an improvement, and in a few cases even a cure of the diseases, by the administration of this gland. From the standpoint of the "hyperthyreosis theory" this seems to be unexplainable. My personal experience coincides with that of the majority. Only a few grains of the thyroid were sufficient to produce a pronounced distress; tachycardia, tremor, vasomotor symptoms became markedly increased, and the patient begged to discontinue the remedy.

One of the cases of Graves' disease which figure as being cured by the thyroid treatment was that of D. Owen.[32] This author discovered later, however, that his patient had all along taken the thymus instead of the thyroid gland. Thereupon the thymus was employed intentionally for this disease, by Owen himself, by Cunningham,[33] and by Mikulicz,[34] with favorable results. One patient of mine has been taking the raw thymus gland for the last twelve months; the exophthalmos, goitre, and some other symptoms are nearly entirely gone, but not the tachycardia. There is perhaps a reduction of ten to fifteen beats in a minute; however, the patient does not complain

of palpitation, nor in fact of any other subjective or objective symptom. The doses are the same as given in Goitre (which see).

Electricity.—The nervous symptoms and the prevailing theories of the nervous origin of Graves' disease early suggested the use of electricity as a therapeutic measure in this disease. The galvanic current has been and is still in general use. It deserves especial mention that there is no author who has tried the galvanic current and has not seen a more or less distinct improvement of the disease from its prolonged and judicious use. As to the mode of application, however, there is quite a variety of methods. One proposes to galvanize the cervical medulla, the other the sympathetic nerve, the heart, the goitre, and even the exophthalmos. The strength of the current employed has been usually not more than a few milliampères. Lately, however, there is an increasing tendency to employ stronger currents, and Rockwell,[35] who has seen in many cases very good results from his method, used in some cases as strong a current as 60 milliampères. Vigouroux[36] recommends highly the faradic current too, and Eulenburg[37] speaks favorably of franklinization and of electric baths. The unanimity with regard to the favorable effects of electricity in Graves' disease is, however, restricted to the use of the galvanic current. Moebius, who admits the favorable influence of electricity, believes, however, that this is only due to suggestion. The following contrast of opinions is interesting and instructive: Buschan,[38] who is an adherent of the nervous and a disbeliever in the thyroid theory of Graves' disease, is quite sure that electricity has an immediate effect, while he suspects that the good results of surgery might be due only to suggestion. Moebius, on the other hand, who is the originator and firm defender of the thyroid theory, is not in doubt at all about the reality of the surgical effects, but is quite sure that electricity means suggestion. *A propos* of suggestion, Audry[39] reports the case of a woman with Graves' disease complicated by hysteria, who became cured after she was made to believe that she was operated; and Brandenburg[40] speaks of a case of Graves' disease which became better in Lourdes.

Surgical Treatment.—The first operation upon the goitre in Graves' disease was performed by Tillaux[41] in 1880. It was thought at that time that he would have very few followers. However, we have at present on record about 200 cases of surgical treatment of our disease. The main increase falls on the last few years, as can be seen from the following data: Mannheimer[42] has collected, in 1894, 42 cases; A. Heydenreich,[43] in 1895, 61 cases; Buschan,[44] about the same time, 80 cases, and in April, 1896, F. Kinnicut[45] collected 187, and M. A. Starr[46] 190 cases. It must be stated that the increased surgical activity apparently was not due to improved methods or

improvement in the surgical technique or to the encouragement derived from an increasing number of good results. It seems to me rather that a strong belief of some surgeons in the thyroid theory stimulated them to their activity. If the manifold and varied symptoms of Graves' disease are caused by hyperthyreosis, by too much thyroid, then the removal of a great part of the thyroid will not only do away with the pressure-symptoms caused by the large goitre, but will also relieve the entire body from an intoxicating overdose of the thyroid. In looking over the various reports we find that those physicians and surgeons who adhere to the theory of hyperthyreosis are very much in favor of surgical treatment of Graves' disease, while those who believe in other theories are strongly against it. However, while I am on the one hand inclined to believe that the outcome of many operations in Graves' disease seems to support the theory that the disease is caused by a certain chemical function of the thyroid, I have on the other hand the positive impression that the results attained by the numerous operations tend to discourage their too frequent application in cases of characteristic Graves' disease. In the 190 cases collected by Starr there were 23 deaths due to the operation alone, which makes a little more than 12 per cent. mortality. This is a little higher than the average mortality of Graves' disease. While these operations, to say the least, did not improve the average mortality of the disease, they shortened life in 23 of the patients. Furthermore, there has hardly been an operation with a successful result which was not reported, while I am sure that many a fatal operation was performed which was not brought to record. Thorough statistics, I believe, would burden the record against the advisability of the operation. There is quite a striking contrast between the results of the operations upon the plain goitre and those upon the goitre of Graves' disease, and some writers believe that the cases with favorable results belong to the secondary form of Graves' disease, with goitre as a primary cause or at least a primary symptom. It seems that in some cases, at least, soon after the operation on goitre in Graves' disease a peculiar, mysterious process takes place. Even when the operation is performed with extreme care and with scrupulous asepsis, soon afterward the temperature of the patient becomes very high, and the pulse reaches 200 per minute; he may yet recover, or he dies in coma.

A friend[1] told me as long as ten years ago that a patient with Graves' disease in whom he had ligated the thyroid arteries had shown soon after the operation an extremely high temperature with a pulse of

[1] Dr. F. Kammerer. He informs me that he has since had another case with exactly the same course as in the first one; in this case the operation was done by resection.

200. We thought of the stimulation of the accelerating nerves and of a reflex upon heat-centres, and similar speculations. At that time there were as yet no such cases recorded. Some writers now try to explain the peculiar phenomena by assuming that the operation causes in some way or other a great flow of "thyroidin" by which the entire body becomes suddenly intoxicated. This extremely interesting fact shows us again that there is yet a good deal to be learned about the thyroid, and we had better wait for more facts before we prematurely attempt to thoroughly explain the few which have just come into our possession. These facts show us also the practical necessity of keeping our hands away from the thyroid gland unless there is an imperative indication for an immediate surgical interference. As to the method, Kocher considers the ligation of the thyroid arteries (only three) as the best one to be employed in operating upon the goitre in Graves' disease. Other surgeons, however, employ mostly resection. Poncet employs his new operative method of *exo-thyreopexie*, that is, the simple exposure of the thyroid gland. It would seem that this ought to be quite a harmless procedure, nevertheless Poncet lost one patient a few hours after the operation in the peculiar manner described above.

We should record here the statements of Hack,[47] B. Fränkel,[48] and others claiming that cases of genuine Graves' disease have been cured by local nasal treatment. Also the removal of a polypus of the uterus was sufficient, it is claimed, to "cure" a case of Graves' disease. Venesection in Graves' disease is a surgical measure of the past.

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DISEASES OF THE THYMUS GLAND.

The thymus gland is situated in the upper part of the anterior mediastinum. It grows only during the first two years of life and remains stationary until about puberty, then as a rule it gradually degenerates, though there are exceptions of a persistent thymus. It is considered as a "ductless gland," though there is no secretion and the tissue is more of an adenoid character. With regard to the pathology of this gland there is not a single point which can be considered as settled. Cases of exudation and suppurative inflammation of the thymus were described, also tuberculosis, syphilis, and malignant tumors of the gland are mentioned. Such cases are at any rate very rare and surely secondary to some primary foci. There is no

reliable symptom by which a positive diagnosis of any of these diseases could be made *intra vitam*. Even at the post-mortem some writers were unable to distinguish between an abscess and normal degeneration of the thymus, or between a swelling of the gland or a cluster of swollen lymphatic glands. Laryngismus stridulus has been in former years ascribed to the swelling of the thymus gland; Friedleben[1] denied such a relation. Lately, however, we find again some authors connecting certain deaths of children under symptoms of spasmus glottidis with the hypertrophy of the thymus (Jacobi,[2] Biedert,[3] Pott,[4] Grawitz,[5] etc). Forensic medicine has cases of sudden deaths of adults on record in which an enlarged persistent thymus was found (Kob,[6] Seydel[7]). Such enlarged persistent thymus glands were also found in cases of sudden death while in the water (A. Nordmann[8]). The usual explanation of the connection between the enlargement of the thymus and the sudden death is to the effect that the enlarged gland is mechanically compressing the trachea and the nerves passing through the narrow aperture of the thorax. Other writers, however, see in the enlargement of the thymus gland only a part of a "status lymphaticus" (Paltauf,[9] Escherich[10]).

We will do no harm to our patients if we admit the possibility that an enlarged thymus is sometimes the sole or a contributing cause of a dyspnœa, especially when the percussion of the upper part of the sternum reveals dulness. In such cases the application of an ice-bag over the sternum or of leeches to the jugulum, or the administration of a purgative might relieve the hyperæmia of the gland and diminish the pressure. We should also bear in mind to avoid the much-feared bending of the head backward (Seydel), especially during the operation for tracheotomy. We should be provided with a long flexible (metallic) tracheotomy-tube in case the usual tube either does not reach or does not pass the obstruction in the trachea. Escherich[11] suggests the feeding with large doses of thymus. Of course, there can be no proper therapy where there is no pathology.

The thymus gland of the animal has lately become important in many practical respects. In physiological chemistry and bacteriology it is used largely on account of its richness in nucleo-proteids. Baumann[12] discovered in the thymus the presence of small quantities of iodine. The thymus gland of the lamb and the calf has lately been employed with good results in the plain goitre and in Graves' disease.[13] On myxœdema the thymus has no effect at all (v. Eiselsberg,[14] Firbass,[15] Escherich[16]). Cunningham,[17] however, has seen some alleviating effects of the thymus upon thyroidless dogs.

Of the function of the thymus gland we have not the slightest knowledge. We cannot fail, however, to note the very recent experimental reports of Abelous and Billard.[18] They have removed the

thymus in frogs and state that the animal shows great fatigue; its green color soon becomes changed, and the blood becomes hydræmic. By grafting the thymus of another frog in the abdomen of the thymus-less frog all the symptoms disappear. The future will show how much there is in this important statement.

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OBESITY.

Definition.—By obesity we designate an abnormal accumulation of fat in that tissue which in the normal condition contains a moderate amount of fat—namely, the connective tissue, or rather the connective-tissue cells. This definition distinguishes obesity from fatty degeneration, which means the presence of fat in tissues which normally do not contain fat at all, or contain it in extremely small quantities like epithelium, muscle-fibres, etc. Both states occur independently of each other, though obesity may lead also to fatty degeneration, especially of the heart-muscle. The abnormal appearance of fat in the animal body is due, as I believe, to a disturbance in its metabolic processes. We shall therefore preface our remarks on the treatment of obesity by a short discussion of some of the laws governing the normal process of metabolism.

Some of the Laws of Metabolism.—The manifestations of animal life mainly consist in two forms of kinetic energy, heat and

motion. The source of this energy is to be found in tissues of the body like the proteids, fat, and carbohydrates (glycogen of the liver, muscle, etc.). Their high complex molecules represent a considerable amount of potential energy. By the dissociation of these molecules and subsequent oxidation to simpler products the potential energy becomes converted into kinetic, the tissues burn up and liberate energy. The final products of the oxidation are water, carbon dioxide, and urea. If an animal be starved, then the continual liberation of energy will be derived from the body-material itself, all tissues contributing toward the expenditure, though not in the same proportion. However, by introducing into the body the very same substances (proteids, fats, and carbohydrates) as food, the body-tissue will be spared, and it depends upon the amounts of these food-stuffs whether the body shows a metabolic equilibrium, a deficit, or a surplus. This is all very simple; but there has been a great deal of interesting work done on the relation of the different foods to the different body-tissues.

At first the simple teaching prevailed that each kind of food attends to the corresponding tissue, *i. e.* the proteids of the body are supported by the ingested proteids, the fat is derived from the fat of the food, etc. Liebig, however, soon demonstrated that animals can be fattened by being fed with carbohydrates alone, and that the fat of the milk in a cow largely exceeds the amount of the ingested fat; and furthermore that the fat of any animal differs in character from the fat of the food it receives. Liebig, then, came to the conclusion that the carbohydrates are the only source for the production of fat in the animal body, and that the ingested fat is never deposited as fat-tissue. This opinion was dominant for many years until Voit and Pettenkofer came out with their theory that the fat of the body is largely derived from the ingested proteids. According to their accounts the nitrogen found in the excreta, especially in the urea, shows the decomposition of a larger amount of proteids than would correspond to the quantity of carbon present in the excreta, and concluded therefrom that a part of the ingested proteids are decomposed into non-nitrogenous products which are retained in the body as fat. The carbohydrates, according to their view, have to do with the formation of fat only in so far as they serve as a ready source of the liberation of energy, thus protecting the non-nitrogenous products of the decomposing proteids from being oxidized to the final products of CO_2 and H_2O. Voit and Pettenkofer strengthened their view by satisfactory experiments and enlisted in their support the fact of the fatty degeneration of proteid tissue like epithelium, muscle-fibres, etc. Pflüger, however, has shown that there was quite an error in the calculations upon which this theory was based, and that none of their experiments

offered a conclusive proof that fat is directly formed from proteids. We mention here these theories because several of the methods of dietetic treatment of obesity which are still in vogue are based upon these different theories of the origin of fats in the animal body.

The following view of the final fate of the ingested food-stuffs within the animal body might be considered as the one at present entertained by all physiologists (except, of course, by those who are still engaged in the defence of a special theory): The ingested proteids are partly utilized as "tissue-proteid," *i. e.* the deposition of the unchanged nitrogenous material in the body-tissue either to supplant the wasted proteids or to add new proteid tissue required to accomplish the growth or the hypertrophy of the body-organs; partly the ingested nitrogenous foods are stored up in the tissue-spaces as "circulating proteids," being there in readiness to meet several requirements. It might protect for some time, in case of starvation, the proteid tissue of the organ from being wasted; it might immediately become decomposed and oxidized to the final waste-products of the proteids, *i. e.* urea, carbon dioxide, and water, thus converting the stored-up potential energy into heat and labor; finally, it might split up into a non-nitrogenous product and be stored away in some of the body-tissues as glycogen. Of fat we now know by the experiments of Lebedoff and I. Munk that under certain conditions the ingested fat can be deposited unaltered in the fat-cells; thus the fat of a dog fed by mutton tallow had a greater similarity to this fat than to the kind of fat usually found in dogs. However, this takes place only under extraordinary conditions; under normal circumstances it is probable that all the ingested fat is burnt up into CO_2 and H_2O, thus providing the body with a considerable amount of kinetic energy. Of the ingested carbohydrates one part is stored up as such in the body (sugar in the blood, glycogen in the liver, epithelium, etc.); another part is utilized for the maintenance of the energy of the body by becoming oxidized to CO_2 and H_2O, a process which the carbohydrates can undergo with readiness, as H_2O exists already, so to say, in a preformed state in its molecule. Finally, a third part of the carbohydrates becomes converted into fat, which is stored away in the body. It seems that under normal conditions the carbohydrates form the sole origin of the fat-tissue of the body. We may also admit that the proteids contribute to the accumulation of fat, but only in an indirect way, by the conversion of the glycogen coming from the proteids into tissue-fat. However, it seems that the contributions from this source form only a small factor in the formation of the body-fat.

From the foregoing statement it can be seen that the services rendered by the three kinds of food-stuffs to the maintenance of the ani-

mal life consist exclusively (except the fraction utilized for "proteid tissue") in the creation of energy liberated by the process of decomposition and oxidation, by the combustion of the ingested food-stuffs within the body. The amount of energy thus derived from the metabolic combustion of the food-stuffs within the body is exactly equal to the energy liberated by the combustion of the same stuffs outside of the body. The energy developed by the outside combustion consists, of course, in the form of heat. We measure this kinetic energy by calories, that is by the amount of heat required to increase the temperature of one cubic centimetre of water one degree C. This is a small calorie. By a large calorie is meant the quantity of heat required to elevate the temperature of one kilogramme of water one degree C. Each of the food-stuffs has a constant quantity of energy —combustion equivalent—which has been determined by many investigators. One gramme of proteid yields about 4.1, one gramme of carbohydrates about 4.1, and one gramme of fat yields 9.3 large calories. When we know the quantities of the three stuffs taken in twenty-four hours, we also know how much energy or how many calories were offered to the body. But this does not tell us the exact amount of combustion which has actually taken place, as not all the consumed food is digested and absorbed. Therefore other methods have been devised to determine the number of calories yielded by the ingested food-stuffs within the body.

There are at present two methods employed for this purpose. One is to determine directly the amount of heat the animal body develops in twenty-four hours. The other method is to determine the amount of nitrogen and carbon excreted in twenty-four hours, and thus the exact amount of food-stuff which was actually combusted in twenty-four hours can be calculated. By determining the N and the C found in twenty-four hours in all excreta (including fæces, etc.) and comparing it with the food partaken in twenty-four hours it can thus be established whether there has been as much expenditure as income (nitrogen- and carbon-equilibrium); or whether more combustible material was ingested than expended, the body storing up the balance; or whether, finally, more material was burnt up than ingested, the body consuming its savings or touching the capital.

The ingestion of food (and inhalation of oxygen) constitute the income, and the muscular exertion and heat-production are the expenditure of the body. Less income or increased expenditure, or both, cause waste; more income or less expenditure, or both, cause obesity.

Etiology.—At present the prevalent opinion is that the chief cause of obesity is to be found in chronic hyperfeeding, *i. e.* the patient partakes constantly more food than he requires for keeping up

the metabolic equilibrium of his body, and the result is that a surplus of the ingested food is stored away in the body, mainly as fat. This implies that the metabolic function of the body is exactly the same in obese as in non-obese individuals. Obesity, then, is not a disease, just as general waste of the body due to starvation cannot be considered as a disease. It seems to me that this conception of the cause of obesity certainly cannot hold good for all the cases of abnormal accumulation of fat in the body. It should be remembered that there are many individuals with striking obesity who are living on only an average diet belonging to the individuals of their height, age, and mode of activity. Further, it is quite certain that one and the same excessive diet leads in one person to a weight, say, of 250 lb., and in another, to a weight, perhaps, of 350 lb. On the other hand, there are persons who habitually consume quantities of food far above those assigned to the "average diet" without gaining by it any abnormal amount of fat. In fact, with some thin persons we can never succeed in making them gain flesh by any amount of overfeeding. In these classes the metabolic equilibrium is apparently independent of the quantities of the ingested food-stuffs. Again, in many cases of obesity, heredity is quite a pronounced factor. Not only that obesity is present in a number of members of the same family, but in many of them the obesity sets in at about the same age. We certainly cannot assume that at a certain age they begin to consume more food. In such cases the obesity is spoken of as a constitutional disposition. Further, the fact that the female sex shows a greater aptness to obesity is surely not sufficiently explained by their diminished activity. Then, obesity in the female sex often sets in after parturition, even without lactation, or with lactation, but especially so with the cessation of the menstrual flow. Here the increase of fat is apparently not due alone to an increase of income of food, or decrease in expenditure. But, above all, the following two well-established facts seem to be quite significant for the question of the origin of obesity: (1) Castration gives rise in both sexes to the development of fat in animals and man. (2) Feeding with thyroid reduces obesity in man and animals. Here we see that the simple removal of a gland causes the accumulation of fat, and that the introduction of the substance of another gland into the body causes the disappearance of fat; in other words, the presence or absence of a surplus of fat in the body is due, in these cases at least, to the absence or presence of some gland-tissue in the body and in a measure independent of the amount of the ingested food. Taking all these and similar other points in consideration, I arrive at a different conception of the origin of obesity, which is, briefly stated, as follows:

The normal metabolism of the body stands under the care of an

agent or rather of agents who supervise the proper distribution of the ingested and absorbed food-stuffs among the several functions of the metabolic process. There is an agent which guards the conversion of carbohydrates, especially of the glycogen of the liver, into sugar, normally carried in the blood, which is not to exceed 0.2 per cent. There is another agent stationed in the thyroid gland guarding against the formation and accumulation of myxœdematous tissue. Further, there is probably an agent, whose character and domicile we as yet do not know, but whose task it is to prevent the retrogressive metabolic products of the proteids from being deposited as uric acid in the tissues of the body. And there is, I suggest, an agent whose task it is to permit only a small part of the body's income to serve as a deposit in the fat-cells. With all the agents doing their duty there is a physiological, harmonious working of the machinery of the metabolic process: no matter how much sugar is ingested, no diabetes will come; no matter how much proteid is absorbed, no arthritic diathesis, no gout need appear; and probably, no matter how much food is consumed, there need not be any obesity. However, if the glycogenic agent is lax in the performance of his duty, large amounts of ingested glucose will force the entrance of some sugar into the blood, causing temporary glycosuria, and if the agent is entirely absent from his post, then even small amounts of ingested carbohydrates find their way unchecked into the blood and cause the condition known as diabetes. We believe that the same applies to the condition known as obesity. If the agent guarding against the conversion of the body's combustion-material is doing its duty carelessly, an overflow of the body with combustion-material—by overfeeding—will cause a deposition of fat in the connective-tissue cells; but if the agent is entirely off his post, then even an average diet will gradually lead to obesity. The tendency of the fat-cells to take the body's food differs favorably from the other metabolic disorders, as it only drains upon the surplus of the combustion-material and readily returns its savings when the body is in need of material—when it is in a starving condition. On the other hand this metabolic disorder is guarded against, it seems, least of all; therefore overfeeding leads in quite a large number of cases to obesity, the proportion being here apparently larger than in the production of cases of temporary glycosuria by the consumption of too much sugar. The agency against the myxœdematous degeneration seems to be the best-guarded post in the metabolic functions.

We know as yet very little of the real nature of the agent guarding against lipomatosis, but it seems that we already know something about the glands serving as domiciles for our agents, and, after all, this kind of information is all we possess of the agent guarding against myxœdema or the agent controlling the production and distribution

of sugar. It is just our knowledge of the latter agent which might serve us as an instructive instance. Von Mering and Minkowski discovered that the total removal of the pancreas produces diabetes; this important fact is now well established. Now the pancreas, besides controlling the production of sugar by "internal secretion," has other well-known functions. Again, even if the sugar-controlling function of the pancreas be perfectly intact, diabetes can be produced by other known and unknown agents. We learn here two important facts: That one and the same gland can attend to two or more separate functions, and that one function can be attended by two or more agents. As to the over-production of fat, we have seen that the feeding with thyroid gland reduces lipomatosis and prevents the re-accumulation of adipose tissue. The thyroid gland, then, secretes, besides the substance preventing a myxœdematous degeneration, also a substance assisting in the prevention of abnormal formation of fats. On the other hand, the removal of the generative organs is often the cause of the deposition of much fat in the body. This looks as though these organs, besides attending to their well-known function, assist by some "internal secretion" in keeping down the tendency to obesity. There is nothing in the way of assuming that some more organs participate in a larger or lesser degree in the same task.

This is not the place to dwell much longer on the particulars of this theory; I wish only to emphasize with a few words its main points. The normal course of the metabolic processes of the body is guarded and controlled by factors furnished by the "internal secretion" of some or all of the glands of the body. This applies also to the deposition of the proper amount of fat in the body. The abnormal accumulation of fat indicates a disturbance of function, a diminution or entire suspension of activity of one or more of the controlling factors. Obesity, then, is a disease caused primarily by a disorder in one of the links of the metabolic chain; the consumption of too much food is only the external cause of the condition.

Extent and Course.—As a moderate deposition of fat in some parts of the body must be considered as normal, it is impossible to draw a distinct line between the normal and abnormal accumulation of adipose tissue, at least in moderate cases of obesity. For practical purposes we may accept a certain standard of weight for a certain height and age, and then consider an addition of 20 per cent. of weight as being yet within normal. We might also be guided by the amount of inconvenience the obesity is causing the patient; this, however, varies within a wide range. I know a patient who bitterly complains of the annoyance her fat is causing her at a weight of 170 pounds, and I know another one who has no complaint to make whatsoever at a weight of 330 pounds. We should also remember that

many of the complaints, especially of our female patients, are prompted not by bodily discomforts, but by so-called æsthetical conceptions, which vary not only with continents and races, but also with individuals. The amount of fat which can be deposited in some obese individuals seems to be enormous, and often considerably exceeds the weight of all the other tissues of the body taken together. The Fat Men's Club in New York counts many members whose weight exceeds 300 pounds. An actor in Dresden, Nicolini, weighed 560 pounds; when he knelt on the stage a valet had to help him to get up.[1] E. Bright, an Englishman, weighed 616 pounds.[2] Kisch quotes Wadd as an authority for the statement that there was a man in New York who weighed 1100 pounds.

Obesity in its moderate degrees can be borne by the patient without much inconvenience and does not lead to serious disturbances in any of the functions of the body. Higher degrees of obesity, however, are usually of great annoyance to the patient and earlier or later cause serious effects which will eventually endanger life. The patient is short of breath, fatigues easily, perspires at the slightest provocation. There is often present a certain laziness of the body combined with sluggishness of mind. Fat gradually infiltrates the tissue-spaces between the muscle-fibres, covers thickly the heart, largely accumulates in the liver, lowering the blood-pressure of the entire body and causing congestion within the portal system, with their consequences of œdema, albuminuria, hæmorrhoids, etc. It leads also to sterility, to premature amenorrhœa, to loss of the sexual instincts, and to impotence. The constant excessive drain upon the nutritive fluids of the body combined with the impaired intestinal absorption leads to a diminution of the proteids of the body and of the blood, and the impaired respiration and circulation do not provide the hæmoglobin with a sufficient amount of oxygen, thus causing a constantly progressing anæmia. This in turn leads further to arteriosclerosis, fatty degeneration of the kidney-epithelium and of the muscle-fibres of the heart—and to sudden death from cerebral apoplexy or from paralysis of the heart.

Treatment.

The chief measure for the reduction of the surplus amount of fat is the regulation of the diet, or rather its reduction. This is, of course, in perfect accord with the prevailing view that too much eating is the only cause of the too much fat. For the theory that obesity is primarily a functional disease of the metabolism, the regulation of the diet has the value only of a symptomatic treatment,

[1] Froelich, *Eulenberg's Real-Encyklopädie*, 2 Aufl., Bd. vi. S. 455.
[2] *Phil. Trans.*, vol. xlvii. p. 188.

while the main object of the therapy should be the administration of a remedy for the re-establishment of the disturbed function. We must acknowledge that we do not possess such a remedy. However, our efficient treatment of the other diseases of metabolism, like diabetes and myxœdema, is, after all, not more than a symptomatic one. The most efficient treatment of diabetes is the withholding of carbohydrates, and the only treatment of myxœdema is the increase of the expenditure by the administration of the thyroid. In both cases the disease returns when the treatment is discontinued. In the treatment of obesity we are even more favorably situated, inasmuch as we are in a position to influence the income as well as the expenditure, as we shall see presently.

As just said, the regulation of the diet, the methodical and strict supervision of the amount and character of the patient's food, has always been and is still the chief aim in treating obesity. There are quite a number of specified bills of fare for the diet of obese patients; they were made up by different writers according to the views they held with regard to the origin of the formation of fat in the animal body. These bills of fare are frequently termed "cures." Three of these "cures" are best known and are quoted by all writers on obesity. They are Banting's cure, Ebstein's cure, and Oertel's cure. We shall describe them here briefly.

Banting's Cure.—William Banting was an obese gentleman who followed out a certain diet prescribed for him by his physician, William Harvey. He was so much pleased with the result of his diet (he lost 35 pounds) that he described it in an open letter for the benefit of the public.[1] His bill of fare is as follows:

Breakfast.—Four or five ounces of beef, mutton, kidney, broiled fish, bacon or cold meat of any kind except pork; a large cup of tea (without milk or sugar), a little biscuit, or one ounce of dry toast.

Dinner.—Five or six ounces of any fish except salmon, any meat except pork, any vegetable except potato, one ounce of dry toast, fruit out of a pudding, any kind of poultry or game, and two or three glasses of good claret, sherry, or Madeira (champagne, port, and beer forbidden).

Tea.—Two or three ounces of fruit, a rusk or two, and a cup of tea without milk or sugar.

Supper.—Three or four ounces of meat or fish, similar to dinner, with a glass or two of claret.

For a "Night-cap," if required.—A tumbler of grog (gin, whiskey or brandy, without sugar) or a glass or two of claret or sherry.

We see that this bill of fare permits plenty of meat and fish, is also quite liberal with alcohols, but cuts down carbohydrates and avoids especially fat. It is evident that it was built up upon Liebig's

[1] *A Letter on Corpulence, Addressed to the Public.* London, 1863.

conception of the origin of fat. This diet has been largely employed and with quite satisfactory results, *i. e.* as far as the obesity is concerned; but it aroused also quite an extensive opposition on account of the many harmful effects which this sort of diet, so it is claimed, produces: It destroys the digestion, it produces general weakness, it leads to arthritis, it favors the development of tuberculosis (?), it leads to insanity, and it has been the cause of many deaths.

Ebstein Cure.—The diet which was recommended by Ebstein for the reduction of obesity is quite the reverse of the Banting cure. It is as follows:

Breakfast.—One large cup of black tea, about 250 grammes, without milk or sugar, 50 grammes of white or toasted brown bread, with plenty of butter. (In winter about 7.30, in summer about 6 or 6.30 A. M.)

Dinner (between 2 and 2.30 P. M.).—Soup, often with marrow, from 120 to 180 grammes of roasted or boiled meat, vegetables in moderation, leguminous preferably, but also cabbages. Owing to their saccharine ingredients, turnips were almost and potatoes altogether excluded. After dinner a little fresh fruit when obtainable. As *compote:* Salad or occasionally some stewed fruit without sugar. *Beverage:* Two or three glasses of light white wine. Immediately after dinner a large cup of black tea without sugar or milk.

Supper (from 7.30 to 8 P. M.).—In winter almost invariably, in summer occasionally, a large cup of black tea without milk or sugar. An egg or a slice of fat roast beef, or both, or some ham with its fat; Bologna sausage, smoked or fresh fish, about 30 grammes of white bread well buttered, eventually a little cheese and some fresh fruit. Sugar, sweets of all kinds, and potatoes are forbidden.

Ebstein cuts down meat and reduces also carbohydrates, but allows quite large quantities of fat. Ebstein came out with his plan of diet a year or two after the publication of Voit's treatises on metabolism, and he was apparently influenced by the theory of Voit that the proteids contribute largely to the formation of fat. Ebstein's partiality for fat in the food is caused by the idea that fat satisfies the appetite better than proteid and carbohydrates, and that a person who partakes of fat requires a smaller amount of food. It is claimed by some writers that the reduction of obesity accomplished by Ebstein's method is due to the dyspepsia caused by the ingestion of too much fat. It deserves, however, to be especially pointed out that so far no other objection has been raised against the Ebstein cure.

Oertel Cure.—Originally Oertel's diet was arranged for the treatment of cardiac troubles, but, noticing the loss of weight in the patients so treated, Oertel applied his diet also to the treatment of all cases of obesity. It is as follows:

Breakfast.—50 grammes of wheat bread; 130 c.cm. of coffee; 20 c.cm. of milk, and 10 grammes of sugar.

Dinner.—Soup 150 c.cm.; 200 grammes of stewed beef; 100 grammes of vegetables, 50 grammes of salad, 100 grammes of dessert made of flour, 50 grammes of black bread, and 125 c.cm. of Pfalzwein.

Afternoon.—130 c.cm. of coffee, 20 c.cm. of milk, and 10 grammes of sugar.

Supper.—One soft-boiled egg, 150 grammes of fried meat, green salad 50 grammes, a roll of 50 grammes, Pfalzwein 250 c.cm., and water 250 c.cm.

The amount of proteids and carbohydrates of the Oertel diet exceed those of the other two bills of fare, while the amount of fat is less than in the Ebstein and more than in the Banting diet. The main feature of the Oertel cure is the considerable reduction of the fluids which the patient is allowed to take. This, however, is by no means original with Oertel. Some twenty years before Oertel adapted it for his diet, Dancel recommended the restriction of the drinking of water as a chief means for the reduction of fat. Oertel's cure aroused quite a lively opposition from many quarters; it is claimed by some writers that it is a dangerous procedure which has caused some deaths.

The fact that a reduction of fat was accomplished by each of these three methods of treatment shows that the success does not depend so much upon the reduction of a special food as upon the reduction of food in general, this reduction being quite considerable in all the three methods, as we shall see presently.

We have seen above that the value which the food has for the body is measured by the calories it represents. By a large number of experiments it was established that the "average diet" of an adult of medium size, in order to maintain the metabolic equilibrium, has to represent about 3000 calories. The "average diet" compounded by Voit is as follows: Proteids 118, fats 56, carbohydrates 500 grammes. This is equal to about 3054 calories. The proportion of the different foods to one another can be varied considerably, but the final sum must represent about 3000 calories. Let us now calculate the calories which are represented in the three diet-cures for twenty-four hours:

	Proteids.	Fats.	Carbohydrates.	
Banting	172 grammes	8 grammes	81 grammes	= 1112 calories.
Ebstein	102 "	85 "	47 "	= 1401 "
Oertel	183 "	38 "	143 "	= 1690 "

We see that in these diet-plans the number of calories is cut down to about one-half, in Banting even to one-third, of the number re-

quired for the normal "average diet." The "cures," then, mean practically, wasting away of the body by starvation.

At present these cures are no longer followed out so strictly, inasmuch as every "specialist" on obesity is devising his own bill of fare, but the basis of all these diet-cures still is the considerable reduction of the daily food. For instance, the diet-plan which was devised by Kisch of Marienbad, for the so-called plethoric obesity, contains about 178 grammes of proteids, 11.3 grammes of fat, and only 80 grammes of carbohydrates for twenty-four hours, which is equal to only 1081 calories. When we consider that some of the patients are used to a diet about twice as large as the normal one, this reduction would mean one-sixth of the patient's former diet.

According to Hirschfeld, during these cures the amount of nitrogen found in the excreta collected for twenty-four hours exceeds the quantity of nitrogen contained in the food partaken in that time. This means a constant loss of body-proteids, and must finally lead to a serious condition. Von Noorden and Daber, however, dispute the correctness of this statement. However this may be, for various reasons we shall not advocate here those dietetic plans of treatment which prescribe such a large and abrupt reduction of the food of the obese patient. The obese condition, though a pathological one, had a gradual development, and the metabolic mechanism gradually adapted itself, to a certain degree, to the new circumstances. Any radical and abrupt change is liable to work like a shock and bring on an irreparable disturbance in the equilibrium. Then, such radical, unbearable measures will not be carried out by the patient for any length of time, and he will soon fall back into his old habits: that is how the patients who leave Carlsbad gain in the first week a good part of the fat they lost there; they are glad, as they say, to have a good meal again. Neither is such rapid and radical reduction necessary; the endangering and annoying symptoms are already relieved by a loss of only a few pounds, which can be attained in quite a short time by a moderate change in the food. The balance of the fat can be finally reduced by a gradual and slow increase in the reduction of the food; thus the patient's habits in eating will undergo a slow but sure change with less prospects of a relapse. The metabolic mechanism, too, I believe, will regain more resisting power against a new overflow of nutritive material by a gradual re-adaptation to the original working of the normal mechanism. The different behavior of the fat-cells under slow and rapid reductions seems to me quite significant. When the reduction takes place gradually, the fat leaves the cell little by little, and the membrane shrinks around the remnant; when all the fat is gone, the cells regain the appearance and behavior of a normal connective-tissue cell. In rapid reductions the fat leaves the cell rap-

idly, and the vesicle becomes filled with serous fluid—the so-called serous fat-cells. It is not impossible that such a distended cell exerts a greater mechanical (or chemiotactic?) attraction upon the surrounding fat-forming nutritive material.

A conservative plan of dietetic treatment of obesity has been put forward quite recently by E. Pfeiffer. He recommends that the first reduction of food should be arranged upon the basis of a "maintenance diet" (*Erhaltungskost*)—*i. e.* such a diet as is required to maintain the metabolic equilibrium of the average weight of a normal body of a certain age and height. The average weight which is to be expected at a certain age and height can be found in the well-known table of Quetelet (Table I.):

TABLE I.—*Quetelet's Table, showing Expected Weight at a Given Age and Height.*

	Men.		Women.			Men.		Women.	
Age.	Height in Meters.	Weight in Kilos.	Height in Meters.	Weight in Kilos.	Age.	Height in Meters.	Weight in Kilos.	Height in Meters.	Weight in Kilos.
0 . . .	0.5	3.2	0.49	2.91	13 . . .	1.44	34.4	1.40	32.9
1 . . .	0.7	0.45	0.69	8.79	14 . . .	1.49	38.8	1.45	36.7
2 . . .	0.77	11.34	0.78	10.67	15 . . .	1.55	43.6	1.49	40.4
3 . . .	0.86	12.47	0.85	11.79	16 . . .	1.59	49.7	1.54	43.6
4 . . .	0.92	14.23	0.92	13.00	17 . . .	1.63	52.9	1.56	47.3
5 . . .	0.99	15.77	0.98	14.36	18 . . .	1.66	57.9	1.56	51.0
6 . . .	1.05	17.24	1.10	16.01	20 . . .	1.67	60.1	1.57	52.3
7 . . .	1.11	19.10	1.15	17.54	25 . . .	1.68	62.9	1.58	53.3
8 . . .	1.16	20.76	1.18	19.08	30 . . .	1.68	63.7	1.58	54.3
9 . . .	1.22	22.65	1.19	21.36	40 . . .	1.68	63.7	1.58	55.2
10 . . .	1.28	24.52	1.25	23.52	50 . . .	1.67	63.5	1.53	56.2
11 . . .	1.33	27.1	1.30	25.7	60 . . .	1.63	62.9	1.52	54.3
12 . . .	1.39	29.8	1.35	29.8	70 . . .	1.62	59.5	1.52	51.5

For instance, if a man of forty and a height of 168 cm. weighs 100 kilos, we know by Quetelet's table that his normal weight should be about 64 kilos. Forty-five calories is about the food-value required as an average diet for each kilogramme of the body's weight. When we now multiply 64 by 45, we find that the food of our patient must represent 2880 calories. These calories we can distribute between the food-stuffs in the proportion of proteids 17, fat 8, carbohydrates 72, and we then have the "maintenance diet" of this patient. In this manner we can easily ascertain to what quantities we have to reduce the food of all obese patients. If under this diet no reduction takes place, Pfeiffer recommends in the first place to increase the proteids at the expense of fat or carbohydrates, but so as to keep up the normal number of calories. If, then, there is still no reduction, or the reduction is too small, a reduction of the calories must be instituted

by cutting down the carbohydrates by 50 to 100 grammes a week, thus gradually approaching the Ebstein cure.

Pfeiffer's method, conservative and commendable as it is, still has the disadvantage of starting the change with too great an abruptness in many cases of obesity. When the patient, indeed, has been in the habit of eating a good deal, perhaps twice as much as his "average diet," which is by no means a very rare occurrence, the "maintenance diet" will mean for him a sudden reduction to one-half of his usual food. The objections which I raised above against the rapid reductions in the other methods also hold good against the rapid changes occurring when treating by Pfeiffer's method. I also believe that a reduction of 400 calories a week is rather too great when the diet is already below the average: in four weeks the diet will be less than one-half of the normal.

For these reasons I propose to modify Pfeiffer's method in some respects.

In every case of obesity we should try to ascertain the quantities of food our patient is in the habit of partaking. A reduction not exceeding 400 calories should then be established for the first week; and each week the reduction should be increased by about the same amount until the line of the maintenance diet is reached. Below this line the increase in reduction must not exceed 100 calories a week, and must not go below two-thirds of the average diet. A reduction below the maintenance line should be undertaken only to meet serious disturbances or annoyances, while the reduction of the diet, as long as it is above the average line, might be instituted for less serious reasons, for a diet above the average is an abnormality in itself. Further, it should be ascertained in which kind of food the obese patient is most in the habit of indulging, and just this food should be reduced most, as there is possibly a causal connection between the indulgence in the special food and the increase of the adipose tissue. When there are no special preferences, the reduction should be distributed, as long as the diet is still above the average, between the food-stuffs in the proportion usually present in the average diet (17 : 8 : 72). When already below the average diet the reduction should be confined mainly to carbohydrates, as the main source for the formation of fat, while the proteids should rather undergo a moderate and gradual increase in order to meet an eventual excess of the excretion of nitrogen. While undergoing a food-reduction below the average diet, the strength, heart, urine, etc., should be watched closely, and the treatment interrupted at the first signal of a serious disorder.

The management of this treatment might appear to be more complicated than it really is. I append a table (Table II.) which shows

the percentage of the proteids, fat, and carbohydrates in most of the articles of food which are in use:

TABLE II.—*Percentage of Proteids, Fats, and Carbohydrates contained in the most important Food-stuffs.*

I. ANIMAL FOOD-STUFFS.	Proteids.	Fats.	Carbohydrates.
Beef (raw)	21.39	5.19	
Beef (cooked)	37.73	9.15	
Beef (fried)	32.21	7.81	
Veal (raw)	18.88	7.41	
Mutton (raw)	18.11	5.77	
Pork (raw)	19.91	6.81	
Ham (salted)	22.32	8.68	6.38
Hare (raw)	23.34	1.13	0.19
Venison (raw)	19.77	1.42	1.24
Liver-sausage	15.93	26.33	
Chicken	19.72	1.42	
Duck	22.62	3.11	
Codfish (fresh)	17.09	0.35	
Salmon (fresh)	13.10	4.57	4.67
Mackerel	18.80	8.20	
Pike	20.11	0.69	0.92
Oysters	8.00	13.00	1.50
Liver	19.59	5.60	1.10
Bacon (salted)	9.72	75.75	
Eggs	12.55	12.11	0.55
Milk	3.31	3.66	4.92
Cheese (fat)	27.16	30.43	2.53
Cheese (lean)	32.65	8.41	6.80
Butter	0.86	83.11	0.70
II. VEGETABLE FOOD-STUFFS.			
Wheat bread	9.60	1.00	60.10
Rye bread	8.50	1.30	52.30
Potatoes	1.79	0.16	20.56
Carrots	1.04	0.21	9.40
Turnips	0.96	0.16	5.98
Radishes	1.23	0.15	3.79
Asparagus	1.98	0.28	2.74
Peas (green)	5.75	0.50	10.86
Beans	2.77	0.14	7.02
Cauliflower	2.53	0.38	5.01
Winter-cabbage	3.99	0.90	11.63
Cabbages	2.50	0.50	4.0–6.0
Spinach	3.15	0.54	3.34
Mushrooms	2.57	0.13	4.76
Cucumber	1.02	0.09	2.28
Lettuce	1.41	0.31	2.19
Sugar			96.73
Honey	1.29		81.44
Apples	0.39		12.90
Pears	0.36		11.80
Plums	0.40		8.24
Cherries	0.62		11.15
Grapes	0.59		15.32
Berries	0.50		7.00
Walnuts	16.37	62.86	7.89
Chestnuts	5.48	1.37	38.34
Beer	0.49		4.55
Brandy			69.50
White wine			11.82
Sherry			22.36
Champagne			11.95
Coffee	0.16	0.50	1.40
Tea	0.30		0.60
Thin soups	1.10	1.50	5.70

Knowing that each gramme of proteid is equal to 4.1 calories, a gramme of fat 9.3, and 1 gramme of carbohydrates 4.1, and knowing by the Food-table the amount of proteid, fats, and carbohydrates contained in each article, we can easily compound a diet which shall represent a certain number of calories. In the beginning of the treatment it will be better to have the patient weigh exactly the food which he is to take. Later on he will have learned to estimate the weight of a certain piece of food by its apparent size, and a certain measure of laxity might be overlooked.

With regard to *drinking*, as far as it refers to water, no great restrictions should be made. It seems now to be the opinion of the majority of observers that the reduction of water might lead to a

reduction of the body but not of its fat. A reduction to less than 1000 c.cm. in twenty-four hours is even harmful, as the kidneys might become irritated. However, in cases of obesity combined with dropsy, a reduction of fluid is rather advisable, especially when the patients were in the habit of consuming large quantities of water. Alcoholic beverages might be taken in small quantities as long as their caloric value is taken into account. However, it should be remembered that according to Miura alcohol causes a greater decomposition of proteids in the body and that it leads to fatty degeneration of certain tissues.

Saline purgatives have been and are still greatly in use in the treatment of obesity. Their fat-reducing effect, if they have any, might be due to the premature removal from the intestinal canal of a part of the food which, were it permitted to remain longer, would finally have been digested and absorbed; the effect then amounts practically to a food-reduction, the extent of which remains unknown. It might perhaps affect the weight of the body also by the withdrawal of a quantity of fluid. It is a fact that obese patients are sent to Carlsbad, Marienbad, Kissingen, etc., where they indeed often lose quite a great deal of their weight within a short period. But the strict diet the patients are put upon in these places amounts sometimes only to one-third of the average diet, and Seegen and others insist upon, and claim to have shown it by experiments, that the use of the minerals without the diet has no reducing effect upon obesity. However, my own impression is that the effect often varies with the individual: in some cases we see a distinct reduction running parallel with the administration of the minerals; in some other cases, again, there seems to be no effect or rather some small increase in weight following the frequent use of mineral laxatives; the loss in these cases is probably being compensated or even over-compensated by the improvement of the digesting and absorbing powers of the cleansed digestive canal. My own policy is to permit the liberal use of bulky carbohydrates like salads, etc., which satisfy the appetite by virtue of their large mass, and then advise the frequent use of Carlsbad salts for the purpose of the early removal of the cellulose, etc.

Next to the reduction of the diet, *an increase of the expenditure* should be greatly encouraged. This is accomplished in the first place by an extended muscular exertion, which is in itself an expenditure of energy; then it increases the heat-dissipation, and finally it increases the number of the respirations and cardiac beats, by which increase more oxygen is brought to the blood and to the tissues, and that means better oxidation and increased metabolism. We might perhaps consider the increased perspiration caused by muscular exertion also as an effect favorable to the reduction of the body-weight.

In plain cases of obesity not complicated by any disturbance in the circulatory system, all sorts of muscular activity should be encouraged, like walking, climbing, horseback and bicycle riding, rowing, etc., especially as long as the diet is above the average line. It must, however, be remembered that, if the supply of nitrogenous food is insufficient, the muscular exertion might lead to a greater excretion of urea and to a deficit in the nitrogen-equilibrium. In cases showing a disturbance of the action of the heart, the muscular work must be done with great care, and is best restricted to walks and very mild climbing, starting with a minimum and gradually increasing according to the condition of the patient. He must be instructed to rest as soon as he feels palpitation. The effects of the moderate movement can be well supported by *massage*, which also must not be of a violent character.

During sleep the muscular activity of the body is at its minimum, being restricted to the contraction of the heart and the respiratory muscles; the tonicity of all the muscles is probably also diminished. Therefore in cases of obesity *long sleep should be discouraged;* six to seven hours a day are sufficient, especially in uncomplicated cases of obesity. Obese people have a special inclination for an after-meal sleep; it should not be permitted.

Hot baths, especially hot vapor or dry-air baths (Turkish) seem indeed to reduce the weight of the body in a moderate degree, as can be established by weighing the patient before and after the bath. Whether this is due to a loss of water by perspiration or to a genuine increase of the metabolism is not yet established. We should remember, however, that in a hot atmosphere there is less expenditure of energy—people therefore gain flesh in summer in spite of profuse perspiration—on account of the diminished heat-dissipation and relaxation of the muscular energy. Hydrotherapeutists, however, claim that the weight-reducing effect of the baths occurs only when there is an abrupt change from hot to cold and that it is the shock which increases the metabolism of the body.

Medicinal Treatment.—There are quite a number of drugs on record which were at one time or another recommended by some one of more or less acknowledged authority as efficient remedies against obesity. Iodide of potassium, liquor potassa, potassium bromide (with sodium carbonate in Barnay-Schindler reduction pills), acetic acid, etc., all were more or less often advocated, and they may indeed have effected some reduction in some cases of obesity. But the favorable results were apparently rare and not sufficiently convincing, and therefore none of these remedies has ever gained general acknowledgment. We need not enter upon any discussion of the merits of any of these drugs, the more especially as we

now possess an internal remedy for obesity, the efficacy of which became universally acknowledged within a short period. It is—

The Thyroid Treatment.—In our article on the Diseases of the Thyroid we took occasion to describe in detail the treatment of myxœdema with preparations of the thyroid gland. The striking reduction of the myxœdematous tissue in cases of myxœdema and cretinism soon gave rise to the trial and testing of the effect of the thyroid-feeding upon the accumulation of adipose tissue. Barron[1] was the first to record a reduction of ordinary corpulence by the administration of the thyroid, and James J. Putnam[2] recorded reductions of 40 and 47 pounds by this treatment, and soon quite a number of similar reports commenced to come in from all sides. Now it is a universally acknowledged fact that the thyroid rarely fails to reduce the weight of obese individuals. At first the thyroid was used in large doses, and there seemed to be no limit to the degree of reduction possible to attain by this treatment. In a discussion following the reading of my paper on the thyroid-therapy a trustworthy gentleman reported the case of a very obese patient who lost 100 pounds by the treatment with thyroid.

We know now that it is neither proper to use too large doses of the gland even in simple obesity, nor is it justifiable to accomplish such extraordinary reductions. Large doses of thyroid bring out in healthy persons also a number of discomforting symptoms, though they seem never to become as serious as they were found in the cases of myxœdema overdosed by thyroid (thyroidism), nor do these symptoms develop in all individuals; there are normal persons who can stand quite large doses of thyroid without experiencing any disagreeable effects. Another point of importance which has to be taken into consideration while treating obesity with thyroid, is the well-established fact that the decomposition of nitrogenous material has a distinct share in the loss of weight which is caused by the ingestion of thyroid (Wendelstadt and Bleibtreu). That this, however, is not the only cause of the reduction, as was apprehended by some writers, was proven, first, by the fact that the loss of carbon during the thyroid-feeding exceeds greatly the amount of carbon present in the quantity of the decomposed proteids as calculated by the excreted nitrogen; and secondly, by the considerable increase of the general metabolism as seen in the striking increase of the inhaled oxygen and the exhaled carbon dioxide (Magnus-Levy). Further than this, the deficit and the nitrogen-equilibrium can be met to some degree by the addition of proteid to the usual food of the person under treatment. Cunningham kept up animals simply by feeding them on thyroids alone, the proteids

[1] *Liverpool Med.-Chir. Journal*, Jan., 1893.
[2] *Trans. of Assoc. of Amer. Physicians*, May, 1893.

of the thyroid serving as food. The reduction of the body by the thyroid-feeding takes place without the aid of a change in the diet. An increase of the diet, however, overbalances the reducing effect of the thyroid-feeding.

My own experience with the treatment of obesity by thyroid is of the most satisfactory kind, none of my patients having ever had a complaint to make. But I never have given too large a dose, have never allowed the reduction to exceed 20 pounds, always attaining it gradually, and have never treated obesity for any other than good medical reasons. I begin with small doses, 3 to 5 grains of the fresh gland, increased very slowly while constantly having the patient under observation, discontinue the administration of the thyroid at the first sign of some disturbance, and never go above 15 grains a day even if well tolerated. In nearly all of the cases I have seen a reduction of weight finally follow a careful, prolonged, and patient administration of the thyroid. In a part of the cases the administration of the thyroid had often to be discontinued, and we had to be satisfied with the mere checking of the increase of weight. In all cases where a distinct discomfort, especially shortness of breath, was present, a pronounced relief was experienced by the patient shortly after the beginning of the treatment and long before there was any sign of a loss in weight. This is in accord with the observation made by some investigators that the change in the respiratory quotient (increased metabolism) shows up before there is yet any decrease in weight. When larger doses of thyroid were given with a satisfactory result, the only dietetic treatment I have advised was moderate out-door exercise like walking, and also climbing, if possible, and a moderate change in the distribution of food in favor of more proteids. The advice to take less meat, and drink instead more milk during the thyroid treatment applies only to the treatment of myxœdema or cretinism, and perhaps also goitre. When the effect of a full dose of thyroid was not satisfactory, the treatment was supported by a moderate dietetic regimen and according to the plan laid out above, cutting down especially sweets and malt beverages. However, I must repeat that, according to my experience, even the thyroid-feeding alone seldom fails to accomplish a final reduction in weight, if one only has patience and perseverance and is satisfied with such moderate reductions as one pound in two to three weeks. In obesity, too, as in myxœdema, the advice is in place to sometimes change the thyroid preparation. When such doses as 15 grains a day are given, it is advisable to have every third or fourth week an intermission for eight or ten days. Here too, as in myxœdema, these intermissions help to keep up the efficiency of the remedy. When the remedy is discontinued, eventually a return to the original weight might grad-

ually take place, especially when the thyroid-treatment was not supported by some dietetic measures. An early relapse, however, occurs mostly when the thyroid cure is hurriedly carried out and the loss of weight takes place rapidly. When the treatment has been carried out with care and patience, and the patients lose their flesh gradually, so to say imperceptibly, the effect keeps up after discontinuation of the treatment for a long time. A patient who took for six months, three weeks in every month, 10 grains of the fresh gland every day, and gradually lost about 15 pounds without observing any dietetic measures, has not yet regained any of her lost flesh though two years have passed since she discontinued treatment.

We can say that, when the thyroid administration is carried out discreetly and discriminately, with patience and with care, and is supported with such moderate dietetic measures as every patient can easily carry out, the treatment of obesity becomes an exceedingly thankful task.

I have had some experience also with the employment of iodothyrine for obesity. While I can confirm the fact that iodothyrine is capable of reducing fat, I must say that its effect on obesity is a good deal slower than even in myxœdema. As there is hardly any drawback, when the thyroid is handled with care, there seems to be for the present no good reason for a general recommendation to substitute the thyroid by the expensive iodothyrine. However, I have one patient whose stomach could not stand a minimal dose of the desiccated thyroid and who now takes without trouble quite large doses of iodothyrine with some undeniable effect.

Besides the favorable effect of the thyroid treatment upon general obesity I have had excellent success with this treatment in a case with multiple lipomata. The numerous sensitive swellings totally disappeared within five months. The same result was obtained by Dr. F. Kammerer of New York in a similar case, with quite large lipomata.

There is at present a general consensus of opinion to avoid the thyroid treatment in all cases of obesity which show some heart symptoms. By my observation of the early relief which some obese patients with shortness of breath and similar discomforts derive from a few doses of thyroid, I was led to the theory that it is at the heart that the first removal of the fat begins to take place, and I started to try cautiously very small doses of thyroid in cases of fatty infiltration of the heart. Without insisting upon the correctness of my theory, I can state that the practical results are exceedingly satisfactory to me. I quote briefly a few instances:

Mrs. K., thirty-eight years of age, always somewhat stout, and with a systolic murmur, ceased menstruating about three years ago and

became gradually very stout, especially in the mammary, abdominal, and gluteal regions. Recently she became very sick, had five to six characteristic spells a day of angina pectoris with extreme præcordial pain penetrating to the back and radiating into the right arm, constant bradycardia, pulse forty to forty-four per minute, profuse perspiration, shortness of breath, etc. Percussion of heart impossible on account of fat. Nitro-glycerin made the condition worse; iodides, strychnine, valerian, bromides, iron, etc. had no effect. I gave her two and a half grains of desiccated thyroid once a day. After thirty-six hours the pulse went up to sixty per minute, the attacks subsided entirely, the patient stating that a certain inside pressure is leaving her and she can breathe better. After two days more the pulse went up to seventy-two per minute and the patient left her bed. She had no other treatment during this time.

Miss S., seventeen years of age, short, becomes constantly stouter, looks exceedingly anæmic, has often fainting spells, and can hardly walk. Systolic murmur, moderate dilatation. Diagnosis: Anæmic obesity. Arsenic of no use. Blaud's pills improve color but not the fainting spells. Prescribed iodothyrine, 5 grains daily. After four days no more fainting spells; walks now three to five miles a day; lost one pound in two weeks; and she and her family are delighted.

Mrs. P., forty-eight years of age, menstruation still regular, weight increasing, now 192 pounds, for years has had "asthma." Condition now intolerable, cannot climb the stairs, slightest exertion causes dyspnœa and palpitation, profuse perspiration, sits up nights in bed. Heart-sounds clear but hardly audible, râles in the lungs, œdema of the legs, etc. Diagnosis: Fatty infiltration of the heart. I gave her two grains a day of the desiccated thyroid (Parke, Davis & Co.). There was a distinct relief even the next day. The dose was gradually increased to 6 grains a day, which she has taken continually for fifteen weeks. She lost eighteen pounds; œdema, palpitation, "asthma," perspiration, fatigue, are all gone. It is now about twenty-six months since the woman took any thyroid, and her condition continues good.

With regard to the *literature* on the subject of obesity I refer to the works of N. Ebstein: *Die Fettleibigkeit und ihre Behandlung;* K. Kisch: *Die Fettleibigkeit* (*Lipomatosis universalis*), and E. Pfeiffer: "Die Behandlung der Fettleibigkeit," in *Penzoldt und Stinzing's Handbuch der speziellen Therapie*, vol. ii. part 2, p. 16. The reader will find in these works complete lists of the literature of this subject.

DIABETES MELLITUS.

By H. A. HARE, M. D.

In the treatment of diabetes mellitus it is not possible at present for us to base our therapeutic measures on rational grounds except in small part, for as yet neither the physiologist, the physiological chemist, nor the pathologist have been able to inform us as to the nutritive disorders and metabolic changes which underlie the affection as we meet with it in practice.

One thing seems certain in connection with the study of this affection, namely, that the syndrome which causes us to make a diagnosis of diabetes is only composed of symptoms, and no one of these is the cause of the disease. Thus, as in malarial fever, the chill, the fever, and the sweat form a fairly pathognomonic group of symptoms which a few years ago were recognized as the results of some cause which we had not as yet discovered, but which is now known to be due to infection by a specific micro-organism: so to-day the polyuria, glycosuria, hunger, thirst, wasting, itching, furunculosis, and the final development of coma in some cases, means the presence of diabetes mellitus; as dyspnœa, emphysema, and cyanosis may be the manifestations of an asthmatic attack the provoking cause of which is unknown to us.

In asthma the remedial measures looking to a cure are often futile and can never be rationally applied until by thorough examination we find that the attacks depend upon cardiac, gastric, renal, nasal, or other causes, and treatment directed to the relief of the symptoms alone is but little more than temporary in its results. In diabetes our position as rational therapeutists is, however, worse than it is in respect to either malarial fever or asthma; for in the first of these we have long had a specific remedy in quinine, which we now know destroys the malarial organism, and in asthma we have various remedies which by their almost specific effect on the heart, kidneys, or stomach act equally well; whereas in diabetes mellitus we are face to face with a condition, grave in the extreme, in many cases, about which we know almost nothing concerning its minute and important underlying causes. We know of course that a condition exists in which the body is unable to properly utilize carbohydrate materials; that, in other cases, it is not only unfit to do this, but also is so perverted in its function that

it actually uses its own tissues, or other proteid substances given in the food, with which to make sugar which is then poured out in the urine; and, finally, that in some cases it develops a poisonous substance which when it accumulates in the blood speedily causes death. All these processes in their methods and details are practically unknown to us, and although the most ingenious hypotheses have been advanced to clear up the subject, and although the most laborious and accurate investigations have been made for years, as for example by Claude Bernard, Pavy, Von Noorden, Seegen, Lépine, and a host of others, the results so far obtained indicate chiefly that many causes may exist for this curious malady, each one of which may be utterly and entirely apart from the others. In other words, as has already been said, diabetes mellitus is a symptom of a number of underlying causes.

From the mass of research, clinical and otherwise, the following facts seem clear and certain:

First: That at all times there exists in the blood glucose in minute quantities, and that this is utilized for the development of heat and fat in the tissues, and perhaps for force.

Second: That glucose in exceedingly minute amounts is nearly always to be found in the normal urine, but can only be distinguished as a trace by the most delicate tests applied to large amounts of the urine.

Third: That the appearance of glycosuria is not necessarily the development of diabetes, any more than the appearance of albuminuria is the development of Bright's disease. Both are the dominant and most important signs of these affections, and in their absence grave doubt may exist as to the diagnosis; but their presence is not pathognomonic.

Fourth: That glycosuria may occur from the ingestion of an excess of carbohydrates; in other words, as an overflow of starchy educts which takes place when the system has received more than it can use.

Fifth: That transient glycosuria should be regarded as a danger-signal indicating that the ability of the body to deal with starches is impaired, and that its overloading with more starch than it can handle will not only result in a leakage—glycosuria, but in addition so disorder the mechanism of the metabolic processes as to result in the development of the other grave signs of diabetes.

Sixth: That in diabetes mellitus the ability of the nutritive processes is so impaired that the ingestion of carbohydrates by the patient is not only equivalent to pouring oil into a can which cannot hold it, but in addition is equivalent to pouring oil into a leaking can which is held over a fire; not only is the oil not utilizable under these circumstances, but it actually does harm.

The basis of the whole treatment of diabetes mellitus rests to-day upon our knowledge of these facts, chiefly the last two just named, and for this reason we may lay down the rule that the first and most important and most evident therapeutic procedure is to eliminate from the diet of the diabetic those starchy articles which the body is unable to deal with. That this is not really a curative measure is self-evident. It does not result in the repair of the perverted and disorganized functions of nutrition except that by giving them a rest it permits repair and prevents further damage.

The **dietetic treatment** of diabetes mellitus is, therefore, far more important than any other.

There are many diet-lists arranged and designed by different clinicians, all of which strive to decrease the carbohydrate articles to a minimum or to exclude them altogether from the patient's table. The rigor of these lists depends upon the individual views of their designers, and their application so far as rigor is concerned depends to some extent upon the strength of the patient, and his ability to manage small amounts of starch or his inability to do so.

We can therefore divide diabetic patients into several clinical or dietetic groups:

Group I. Those who immediately on taking carbohydrates suffer from a marked increase in the glycosuria and urinary flow. These patients are usually young in years, and their inability to manage even small amounts of carbohydrates is often in direct proportion to their youth. In these patients the diet-list should be rigorously adhered to, except in the cases soon to be named, where an absolute withdrawal of all starch results in greater disaster than its use in small quantities.

Group II. Those who have a marked increase in glycosuria only when they take considerable amounts of starch, and not when small amounts are used.

Group III. (*a*) Those advanced in years, and often obese or gouty, in whom the symptoms of diabetes are not pressing, and in whom the prognosis, with ordinary precautions as to habits, is not unfavorable. (*b*) Those who develop glycosuria on taking much starchy food.

Group IV. Those who fail so rapidly if starches are withheld from them that it would seem as if they required starches to make up for the drain of sugar in the urine.

I. A rigid diet-list for the first class may be adopted as follows, any of the articles named being allowable in full quantity:

Fresh Meats.—Any muscular part of the ox or of any other domestic animal, of the deer, or of wild or domestic fowls or birds. These may be cooked in any simple fashion the result of which does not render

digestion difficult. Terrapin may also be taken. The sweetbread, tongue, heart, and brains of these animals may also be used, plainly cooked, without starch or sugar in the sauce.

Preserved meats of the same sorts as just named are allowable.

Fish of all kinds, if plainly cooked without bread-crumbs or cracker-crumbs. Preferably fried. Preserved fish also. Caviare and cod-liver oil may be given.

Shell-fish.—Clams, crabs, oysters (few), turtle.

Eggs freely.

Fats freely.

Vegetables.—All green vegetables such as lettuce, cress, spinach, cucumbers, onions, asparagus, cauliflower, cabbage, etc.

Spices.—All kinds, in moderate amounts.

Soups.—Clear soups without starch thickening or vegetables.

Cheeses.—Chiefly fatty cheeses like cream cheese, Gorgonzola, Neufchâtel, etc.

Waters.—All effervescing waters, but not sweet soda-water. Waters with lemon-juice added.

Wines and Liquors.—Moselle and Rhine wines, claret, rye whiskey, brandy, cognac, arrack.

Coffee and tea are permitted without sugar but with saccharin.

This diet if possible should be rigorously enforced, and only relaxed when the patient rebels beyond restraint or craves starches to such extent as to be actually in misery from their withdrawal. Then a very small piece of bread may be given once or twice, or in its stead, and better, a little liver, some sausage, cocoa without sugar, turnips, celery, pumpkin, or a few green peas may be allowed. Even if these are allowed frequently, every now and again the patient should follow for several weeks the rigid diet absolutely.

II. For the second class we can allow the articles named in the last paragraph as luxuries for the severe cases, and in addition allow small amounts of beans, mushrooms, artichokes, and Brussels sprouts, with radishes, tomatoes, a few nuts, a small pear, or a small apple or sour orange. Cherries, plums, and currants in small amounts may also be given.

III. The third class may have small amounts (one slice at a meal) of bread, small quantities of zwieback, of chocolate, potatoes and apples, one banana, some walnuts, chestnuts, one peach or some small berries, in addition to the articles named for the first and second classes. The nearer all three classes can follow the strictest diet-list, the better for them.

IV. In arranging the diet for the fourth class we must govern the supply of carbohydrates by frequent examination of the urine. If a patient following the rigorous diet fails rapidly, and a small allowance

of starch does not materially increase the glycosuria and does increase his strength, he must have it in limited amounts.

In all classes of cases the fact that the fats are nutritious, and in one sense can take part of the place of starch in the nutrition, is not to be forgotten, and for this reason the free use of butter, of fried articles, and of fatty foods such as fat salmon, olive oil, fatty cheeses, and the fat part of meats is advisable up to the point at which the patient's digestion is about to fail.

Having discussed the possible diet-lists, we now come to the effects to be sought for and gained by the administration of drugs.

Drugs.—Before discussing these it may be recalled that diabetes may result from syphilis, from gout, from nervous exhaustion, and from growths in the central nervous system which result in functional disturbance in distant organs, chiefly in the blood-supply of the liver. Again, it is not to be forgotten that disease involving the pancreas to such an extent as to prevent it from carrying out its *internal secretion* into the blood-vessels or lymphatics may result in diabetes.

It seems hardly necessary to point out in connection with diabetes in a syphilitic that the iodides and mercury are indicated, particularly the iodides. The effect of these drugs upon syphilis makes a diabetes mellitus due to this infection a disease with a possibly hopeful prognosis, even in a young person, if the syphilis be the cause of the diabetes. The condition of the kidneys and that of the digestion are the only points of caution in this treatment. All other anti-syphilitic treatment may be utilized except hot baths or cold baths, which are generally too relaxing or too exhausting for a feeble diabetic struggling against two grave ailments. As pointed out in Dr. Martin's article on Syphilis, the best treatment by mercury is by inunction.

In those cases in which there is a gouty history, hereditary or acquired, the salicylates in full doses are useful, and even colchicum in limited quantities is to be employed. Arsenic is also peculiarly useful in some of those patients, and if there is any degenerative vascular change nitro-glycerin may be employed. Usually, however, in the gouty diabetic with degenerated vessels the iodides are preferable to all other drugs. Antipyrin may also do good in full dose.

We now come to a third group of cases, the treatment of which is of great importance because they are a numerous class, and can sometimes be much benefited by drugs, namely, that class which develops diabetes after some severe nervous shock or prolonged mental strain in business, professional work, or in the illness and death of near relatives. In this class the institution of the "rest-cure" of Weir Mitchell, as described in Vol. I. of this System by Dr. John K. Mitchell, or the avoidance of all business cares and worries by a trip from home to some healthful spot where rest can be obtained is necessary. In the

way of drugs, opium stands *facile princeps*, itself or its alkaloids morphine and codeine. In respect to these drugs it may be said fearlessly that while they sometimes fail, as do all remedies in many diabetics, that they diminish the excretion of sugar and the polyuria secondarily, and put aside the other symptoms, such as itching and sleeplessness, with a constancy which, in view of our helplessness in this disease, is, to say the least, most encouraging. They will not allow the patient to disregard his dietetic instructions, but they will often allow the use of needed carbohydrates which, without them, the patient could not take, and they aid materially in the fall in sugar-excretion which occurs on instituting an anti-diabetic diet. It may be said, of course, that the fall in the excretion of sugar would be progressive without the opiate, but repeated clinical experience has convinced the writer that the use of this drug emphasizes the effects of the deprivation of starches. This fact is also definitely pointed to by the clinical studies in Charing Cross Hospital made some years ago by Mitchell Bruce, and before and since his studies confirmed by other clinicians. Particularly is opium advisable in those cases in which the patient, unable to leave his business affairs entirely, needs some nervous sedative to "take the edge off" his anxieties. In the use of opium or its alkaloids, however, we must employ large and rapidly ascending doses. The ordinary diabetic can take massive doses of morphine without any manifestation of its physiological effects save in the decrease in the sugar and urinary flow. At the time of writing this article the author has under his care two diabetics representing in one case the class of overworked business men, the other a man who received a great nervous shock by reason of an accident. The first is now taking 1 grain of morphine three times a day by the mouth, and the second 2 grains three times a day by the mouth. Neither manifests any sign of sleepiness or mental torpor nor any ordinary morphine influence, even in the pupils. This dose has been reached in fifteen days by rapidly raising the daily dose from $\frac{1}{6}$ grain three times a day. In the first patient the urine has decreased a quart under a moderately rigorous but by no means absolute anti-diabetic diet. In the second it has fallen from 8 quarts in twenty-four hours to 2 quarts in twenty-four hours, and has remained at about the latter amount for a week. This patient also receives a modified diet, but eats at least two slices of bread a day, and often takes other farinaceous articles. None of these patients seem to develop the true morphine-habit, although the relief of the disagreeable symptoms such as itching and nervousness naturally makes them ready to continue the drug.

In thus highly endorsing the employment of opium and its derivatives the author is well aware that apparent relief may be seen in the natural variations which take place in the course of this disease, and

that in many cases the remedy will fail. Opium itself is most powerful for good, morphine stands next, and codeine is the most expensive and least efficacious. The drug should be fitted to the necessities and the pocket-book of the patient. Further, it is to be remembered that the doses must be ascending, and are to be governed, not by the amount in grains, but by the effects. The patient should take in the end as many grains as are necessary to produce slight drowsiness or slightly contracted pupils. Usually the drug is best given in non-compressed tablet triturates, as by this means the dose is easily increased and the patient can carry it with him without inconvenience.

In this class of cases antipyrin and acetanilide also seem useful, but must be given in full doses. The writer has no experience in their use. In the use of the bromides in full doses, so highly commended by some as nervous sedative treatment, the writer only sees depression and malnutrition from their effects when taken for long periods of time.

The use of the pancreas or its extract in the treatment of diabetes mellitus depends upon the hope that by this means the body will be supplied with that substance which the healthy pancreas naturally pours out into the system. That this internal secretion is necessary for the maintenance of health is proved by great numbers of experiments on the effects of extirpation of this gland in animals, by the fact that death ensues in man from diabetes when this gland is removed (Bull's case), and that diabetes has existed in cases in which grave and universal pancreatic disease destroying the gland is found to be present at the post-mortem examination. The results reached in the cases of diabetes so far reported as treated in this manner are not encouraging since they were not benefited to any great extent, but as they were not all cases of pancreatic disease the test is not complete or reliable. Again, the rarity of diabetes due to pancreatic disease prevents the frequent rational use of this remedy.

Of the value of jambul in the treatment of diabetes the author has had no experience, and its record in medicine seems hardly to warrant much reliance on it.

Mineral Waters.—The value of mineral waters in the treatment of diabetes is greatly exaggerated, yet it cannot be denied that the use of the Carlsbad water *at Carlsbad*, associated with the strict regimen there instituted, greatly benefits patients with this disease, particularly if they are gouty or have been *bon vivants*. In anæmic persons those waters which contain traces of iron, and more important, arsenic, are often useful not so much for their effects on the diabetes as for improving the general health. Such water may be found at La Bourboule. In other instances, usually gouty in character, particularly if the patient is too feeble to submit to the rigorous treatment of Carlsbad, resort may

be had to the alkaline sodium bicarbonate waters of Vichy, Vals, or Contrexeville in France. It is worthy of note that all the springs for the cure of diabetes produce their good effects only when carefully arranged routine measures in relation to diet and habits of life are carried out.

Bathing.—The diabetic patient will often find relief from itching and peripheral irritation in a warm bath, which should be as hot as possible and not tepid. He will rarely be able to stand any cold baths because his heat-production is defective through his loss of carbohydrates. In some cases of moderate diabetes with little wasting, or if the patient is an obese diabetic, hot and cold douches are useful. They should be applied gradually and the first dash should be of hot water and the next of cold. The cold should not be too great (not below 70° F. at first), and the dash of heat and cold should not last over one minute each at the first, lest proper reaction fail to set in.

Often sponging the body with alcohol and water or salt and whiskey will keep the skin clean and avoid the relaxation of the bath.

Climate.—As a rule, diabetic patients do best in a semi-mountainous region such as will be found in Asheville, N. C., or Thomasville, Georgia. The latter is not mountainous, but it is fairly equable and is not a damp climate. High altitudes are nearly always harmful, as they increase the nervous irritability of the patient, are apt to be cold and to produce congestions by chilling him. Similarly seashore resorts are not advantageous, as diabetics do not withstand a damp atmosphere as a rule.

Clothing.—The very fact that the diabetic lacks those elements in his food which ordinarily would add heat to his body and lay a cover of fat under his skin, and the fact that he is especially prone to pulmonary and other visceral congestions, renders the constant use of well-made woollen underwear, such as that of Jaeger, a necessity.

Exercise.—A diabetic patient should not take violent exercise. Gentle walking, or riding a horse, care being taken that fatigue does not result, is advisable, but any hard riding, as bicycling for a great distance, is harmful for evident reasons.

DISEASES OF THE STOMACH.

By THOMAS G. ASHTON, M. D.

ACUTE GASTRITIS OR ACUTE GASTRIC CATARRH.

To this most common of gastric disorders many individuals seem to have a special predisposition, which in some appears to be decidedly hereditary. Such individuals, possessing a "weak stomach" as it has been termed, cannot partake of the quality or quantity of food ordinarily digested without difficulty by the normal stomach, without being subjected to an attack of acute gastritis. These cases are frequently those that give no history of dietetic abuse to which the enfeebled digestion can be ascribed, and yet they have always been liable to attacks of the disorder. In fact, in many of them the history of heredity is evident from the statement by the patient that a parent or several members of his immediate family suffer in the same way.

Acute gastritis is usually to be ascribed to errors in the diet both as regards the quantity as well as the quality of food ingested. If more food be taken than the stomach can digest, irritation of the mucosa results, followed finally by the changes incident to an acute inflammation. In this sense, that is as a local irritation, every case of acute gastritis is, as pointed out by Ewald, in reality a toxic gastritis. The same may be said of those cases of the disease arising after the ingestion of food of improper quality which, during its retention in the stomach, undergoes decomposition and fermentation, the products of which act probably as a local irritant and excite an acute gastric catarrh. These foods may have already undergone decomposition or fermentation at the time of ingestion, and particularly is this true of butter, of eggs, and of articles of diet prepared from eggs; it is also true of the milk and milk-foods partaken of by children, which so readily undergo fermentation during the warm seasons of the year. The fermentation of food after it has reached the stomach seems to depend upon the absence of hydrochloric acid, as in every case of acute gastritis this constituent of the gastric juice is wanting. Just exactly what the product of decomposition is that produces the irritation of the stomach resulting in acute gastritis does not seem to be

definitely determined. That it is not due to lactic acid Ewald [1] concludes from the fact that this substance is normally present, for instance at the beginning of the digestion of food, and that the medicinal administration of lactic acid, as well as its ingestion in such substances as kefir and koumyss, is unattended by any harmful results to the stomach.

As to whether acute gastritis occurs as the result of infection is still a question that requires to be definitely settled. It is extremely doubtful that such an affection prevails as the result of a direct invasion of the stomach-walls by micro-organisms, with constitutional infection. Inasmuch as this form of gastric infection has not been demonstrated, the contention of Lebert that a special infectious form of the disease occurs is not proven, although the occurrence of acute gastritis apparently in epidemics would tend to confirm his view. This latter circumstance, however, is susceptible of the explanation that the greater number, at least, of those cases of so-called infectious gastric fever are in reality instances of the mild forms of enteric fever. Acute gastritis usually accompanies most of the acute infectious diseases, especially at their onset.

Treatment.

A knowledge of the etiology of acute gastritis will aid us materially in instituting an efficient therapeusis. It teaches us that the affection is not of spontaneous occurrence, and that it is always induced by the direct introduction into the stomach of some irritating substance. Of course, the indication is the removal of the source of irritation.

In mild cases the stomach cares for itself, and by spontaneous emesis gets rid of a large quantity of the irritating substances, while the remainder, passing into the intestines, finds evacuation in the diarrhœa which its presence there excites. Under ordinary circumstances, therefore, the patient recovers without the use of drugs, except possibly a mild purgative, and abstinence from food. In most cases fasting is self-regulative, as the complete anorexia accompanying the affection prevents the patient from taking food for twenty-four hours or more. Thus the stomach not only obtains needed rest, but further irritation is avoided.

In severe forms of acute gastritis, requiring the interference of the physician, the treatment should be carried on in such a way that the spontaneous efforts of the stomach and intestines at relief may be aided. When vomiting has not spontaneously occurred, and epigastric distress and fulness indicate that the stomach is full, we must take measures to empty the stomach, especially when the eructation of

[1] *Klinik der Verdauungskrankh.*, Bd. ii. S. 162.

foul-smelling gases associated with pyrosis indicates that the retained gastric contents have become decomposed. While this may best be brought about by the use of the stomach-tube, it is more feasible, perhaps, to first employ other means, as to most of these patients it would imply the introduction of the tube for the first time, and therefore in many of them would excite alarm and constitute an augmentation of their distress. One of the simplest means of emptying the stomach under these circumstances, and one which the people have learned to practise for themselves, is to direct the patient to drink a pint or more of tepid water in which a small quantity of common salt has been placed. The finger may then be carried as far as possible down the throat in order to produce vomiting. In many cases this is unnecessary, as to a good many people the tepid water is in itself sufficiently nauseating to produce emesis.

Should these means prove insufficient the use of emetics may be resorted to, although their use is inadvisable on account of their local irritant effects and the additional distress they cause the patient. As possessing the least of these disadvantages apomorphine, administered hypodermically in doses of $\frac{1}{10}$ of a grain, should be used. In children emetic doses of ipecacuanha or of tartar emetic may be used, but the employment of these drugs is not advised in adults. Should constipation exist and continue for several days, resort must be had to the use of some mild purgative; otherwise no medicine is required in the majority of cases. For this purpose probably the best results are obtained from calomel given in a single large dose of 10 grains, to an adult. Should there be delay in its action it may be followed by one of the mild saline aperients, these remedies in themselves being of very great service. If the effects of calomel be not desired, therefore, we may order Seidlitz powders, a glass of Hunyadi water, or citrate of magnesia, the contents of the bottle as ordinarily purchased being divided into equal doses, the second dose being taken about four hours after the first, should further action be desired. I am in the habit of employing smaller doses of this remedy with greater frequency of administration, and under these circumstances order a tablespoonful or two tablespoonfuls, to be given every hour until the desired effect is obtained. Bicarbonate of soda, subnitrate of bismuth, or other alkalies and antacids may be given if marked pyrosis exist and if the patient be greatly troubled thereby.

For the first day or two the stomach should be allowed almost complete rest from food. Indeed, the extreme anorexia from which the patient suffers practically secures this rest for the stomach, and it is a good plan not to force food upon the patient until he begins to experience a craving for it. For the first twenty-four hours after the stomach has been emptied, therefore, no food should be administered,

the continued irritability of the organ and the thirst from which these patients usually suffer being relieved by the swallowing of small pieces of ice or of small quantities of carbonated water. During the second day food of the lightest possible character may be given, such as milk and lime-water, or a combination of equal parts of milk and Vichy water, some one of the clear broths or soups, strained oatmeal, milk-toast, and the like. As the case progresses we pass to more substantial articles of diet, such as rice, oatmeal-gruel, a soft-boiled egg, buttered toast, and oysters; and later on, as improvement continues, scraped beef, a small chop or small piece of broiled steak may precede the gradual return to the ordinary dietary.

TOXIC GASTRITIS.

This term is usually restricted to those cases of gastritis that arise from the swallowing of substances that directly affect the gastric mucosa, producing either an inflammation of an intense degree, or, as is the case in many of them, causing a more or less extensive destruction of its tissue. Among the substances having this effect when swallowed may be mentioned the mineral acids in a concentrated form, the caustic alkalies, the metals and metallic salts, such as arsenic, phosphorus, corrosive sublimate, potassium chlorate, and other substances such as alcohol, nitro-benzol, and carbolic acid.

The damage done the stomach by the ingestion of any one of these substances depends upon the exact nature of the poison and the amount that has been taken, as well as upon the condition of the stomach at the time, whether full or empty. In the case of the corrosive poisons not only may the mucous coat be involved, but the underlying tissues down to the serous covering may be entirely destroyed and converted into a charred and blackened slough; in this event perforation of the serous coat occurs, and the contents of the stomach find their way into the peritoneal cavity. Alcohol and phosphorus, and drugs acting in a similar manner, produce a very intense form of inflammation, with much swelling of the mucous membrane, accompanied by superficial necrosis and minute blood-extravasations; and by a microscopical examination the glandular structure is observed to have undergone a mucoid and fatty degeneration.

Treatment.

The treatment of toxic gastritis consists theoretically in the prompt evacuation of the stomach-contents; or, failing in that, as in the case of the corrosive poisons, their neutralization and dilution. In all cases of acute poisoning not due to corrosive substances, the stomach should at once be emptied with the stomach-tube in order that that

portion of the poison not as yet having entered the small intestine may be removed, and the further general intoxication of the patient prevented. The use of lavage in these cases is much to be preferred to the administration of an emetic, as the stomach can in this way be more thoroughly cleansed. Lavage is inadmissible in all cases of corrosive poisoning when danger of perforation exists, and if the nature of the poison swallowed be in doubt, inspection of the mouth and pharynx will usually reveal whether or not it be due to any caustic substance. Under these circumstances, therefore, we must rely upon our efforts to effect the neutralization of the unabsorbed portion of the poison that remains within the stomach. In the event of poisoning by an acid this may be accomplished by means of calcined magnesia given in the proportion of about 3 ounces of the magnesia to a pint of water or milk; in the case of the mineral acids a harmless compound is thus formed. If the poisonous substance ingested has been an alkali its neutralization must be brought about by the drinking of lemonade, vinegar, or a weak solution of tartaric or acetic acid. Within the limits of the present article it is impossible to mention all the antidotes of the various poisons, and only these very general lines of treatment can be laid down.

The individual symptoms are to be treated upon general principles. To overcome the condition of profound collapse into which many of these cases rapidly pass it is necessary to surround the patient with artificial heat and to freely stimulate. This latter procedure is rendered impossible by way of the stomach on account of the intense inflammation of the organ and the persistent vomiting usually accompanying the affection. It becomes necessary, therefore, to depend largely upon the hypodermic administration of stimulants, and in this way we may employ strichnine, digitalis, or the more readily diffusible stimulants, such as whiskey, brandy, aromatic spirits of ammonia, and ether. Stimulants may also be given by way of the rectum, and in some cases much advantage is obtained by the rectal administration of black coffee given hot, which not only stimulates directly but also tends to overcome the patient's subnormal temperature. The urgency of the vomiting may be assuaged by the swallowing of small pieces of ice or small quantities of some aërated water or a dry champagne, and for the relief of this symptom good results are sometimes obtained by the frequent administration of small doses of cocaine. The pain attending a severe case of toxic gastritis is usually agonizing and calls for the free administration of opium or one of its derivatives. Unfortunately in many of these cases treatment is simply palliative, and our services to the patient are limited to keeping him as comfortable as possible until death relieves his suffering.

PHLEGMONOUS GASTRITIS.

Purulent gastritis or suppurative inflammation of the stomach is an extremely rare form of inflammation of the stomach; it is more common among men than women and is most frequently met with between the twentieth and sixtieth years. It differs from simple acute gastritis in that the lesion does not exist in the glandular layer of the stomach but in the submucous and muscular structures, in which numerous small abscesses are usually found. The mucous membrane covering the areas of lesion is greatly swollen and infiltrated, and in advanced cases, through implication of the serous coat, perforation occurs into the peritoneum or, by sloughing of the mucous membrane, into the stomach. In size these abscesses vary within wide limits. The disease exists in two forms, the idiopathic or primary and the metastatic. The exact cause of the former is as yet unknown, but it is probable that it is due to a direct infection of the stomach by some pus-producing form of organism. The metastatic variety occurs as a part of a general pyæmia, or accompanies puerperal fever or at times the exanthematous diseases.

Inasmuch as the diagnosis of the affection is rarely possible during life, the outline of treatment can only be symptomatic.

CHRONIC GASTRITIS, CHRONIC GASTRIC CATARRH, CHRONIC GLANDULAR GASTRITIS.

There appears to exist in the minds of many such an imperfect conception of what the term "chronic gastric catarrh" or "chronic dyspepsia" actually implies that a short description of the usually accepted varieties of the condition and the pathological changes taking place seem to be called for. This confusion seems the more remarkable as chronic gastric catarrh is one of the most frequently-met-with disorders and preponderates in all of our large dispensaries. It can be explained only by the fact that much carelessness still exists in the diagnosis of diseases of the stomach, and that the lessons imparted by modern methods of investigation go unheeded. It should first be understood that the term "dyspepsia" should be employed only in a symptomatic sense, leaving the underlying cause still to be looked for. For so long a time has this term been used synonymously with the affection about to be discussed, that it is of the utmost importance that we understand the true cause and the symptoms of the disease, for without this correct treatment is impossible.

The limitations of the present article render impossible an extensive discussion of the pathological changes characteristic of chronic

gastritis, nor does such a discussion seem necessary. It is important to make clear, however, that the affection is characterized by inflammatory processes the initial changes of which may be either an interstitial increase resulting in atrophy of the secretory cells due to the cutting off of their nutrition, or else the glandular structure may be primarily involved with the result that parenchymatous degeneration occurs. In either anatomical form, however, the tendency is to ultimate and complete atrophy of the secreting structure. With the knowledge of these changes it becomes clear that they must give rise to an alteration of the gastric secretions, and inasmuch as the process is an inflammatory one the secretions from the characteristic glandular structure must be diminished; therefore we must look for a diminution of hydrochloric acid and pepsin. This statement does not apply, however, to the secretion from the mucous glands, so that even in those cases in which hydrochloric acid is entirely absent the gastric mucus is often present in excess.

It seems to me that it is still advisable to adhere to Ewald's classification of the disease into three varieties, made in accordance with the character of the gastric contents, so that attention may at least be called to the fact that these contents are not the same in all cases. The affection as thus classified is divided into simple gastritis; mucous gastritis; and atrophic gastritis.[1]

In the first variety the fasting stomach contains a small quantity of mucoid material, thin and watery in consistence, which is not infrequently admixed with the contents of the duodenum and therefore stained a yellowish green by the bile. After a test-meal hydrochloric acid is found, but in diminished quantity; pepsin and the milk-curdling ferment are also lessened, but form peptone and propeptone. Lactic and the fatty acids are usually, although not always, present.

In chronic mucous gastritis the stomach contains large amounts of mucus both while fasting and after the taking of food. There is usually an absence of hydrochloric acid and peptone is present only in traces, while propeptone usually forms abundantly. The milk-curdling ferment is usually absent. Test-tube digestion is possible only by the addition of hydrochloric acid and its retardation even then indicates the lessening in the amount of pepsin. Between chronic mucous gastritis and simple chronic gastritis, however, many intermediate forms occur and the differentiation is not always easily made.

In the third, or atrophic, variety of chronic gastritis the stomach both while fasting and after the test-meal shows an entire absence of mucus, as well as of hydrochloric acid, pepsin and the milk-curdling ferment. To this form, as has been already intimated, the chronic

[1] Ewald, *Klinik der Verdauungskrankh.*, S. 189.

mucous variety gradually tends, in proportion as more or less complete atrophy of the secretory parenchyma ensues.

Chronic gastritis may be said to depend upon causes that act directly upon the stomach, and are therefore primary; and upon those that act upon the stomach secondarily—first, as the result of changes in the circulation dependent upon lesions of other organs; and, secondly, as the result of changes in the state of the blood itself dependent upon general conditions.

The primary causes of chronic gastritis include all forms of local irritation to the mucous membrane of the stomach. Therefore the ingestion of all substances rendered irritating and difficult of digestion by improper mastication, as well as particles of food with which the saliva has been inadequately admixed and thereby predisposed to fermentation when reaching the stomach, constitute direct irritants to the gastric mucous membrane and are therefore causal in the production of chronic inflammatory changes.

Again, the use of such irritants as alcoholic beverages in a concentrated form, highly seasoned foods, and the irritating condiments will, if sufficiently prolonged, result in the establishment of the disease. In the same manner a carious condition of the teeth should be regarded as etiologically important, for the reason that from this source there may arise putrefaction and decomposition of the retained particles of food and secretions of the mouth, which upon subsequent swallowing constitute sources of irritation leading eventually to inflammation. Here should also be included those cases of chronic gastritis arising from the direct local inflammatory changes accompanying new growths and cicatrices in the mucous membrane, as well as those resulting from the irritation produced by the existence of various forms of parasites within the cavity of the stomach or in some portion of the gastric wall. Repeated attacks of the acute and subacute varieties of the disease frequently lead to chronic gastritis, and this can the more readily be understood when we consider that many of the causes of the former are also productive of the latter. Nor must we overlook the functional disorders of the stomach as causes of the chronic structural changes constituting chronic gastric catarrh.

The secondary causes of chronic gastritis, or those due to changes in the circulation and alteration in the condition of the blood, result, in the first place, from all those conditions giving rise to venous stasis and congestion of the mucous membrane of the stomach. These conditions may be looked for in those diseases of the liver and spleen that produce obstruction to the portal vessels, as well as in chronic disease of the heart, either primary or dependent upon lesions of other organs, as of the lungs. Under any of these conditions the resulting venous congestion of the stomach will lead eventually to

chronic inflammatory changes, and to afford relief to the chronic gastric catarrh it is primarily necessary to relieve the condition upon which the venous congestion depends. As the result of the excretion of toxic substances into the stomach attending the blood-alterations incident to such general diseases as the infectious fevers, chlorosis, and profound anæmia from any cause, as well as gout, diabetes mellitus, chronic nephritis, and tuberculosis, the mucous membrane of the stomach is rendered more than normally sensitive to ingested irritants; hence these conditions predispose to chronic gastritis. In the case of chronic nephritis the excretion of urea in the stomach is probably the causative element, and the same may be said of the absorption into the blood, and subsequent excretion in the stomach, of the putrefactive products arising in the intestinal canal.[1]

Treatment.

The treatment of chronic gastritis must begin with the regulation of the diet, a precaution quite as important as the treatment of the disease by drugs. It is self-evident, however, that the diet must vary with each individual case, and that each individual in this respect must be separately considered. It is, therefore, impossible to prescribe a definite diet-list suitable for all cases, a fact that is readily understood when we consider the varying degree with which the secretory glands are affected and their function disturbed, as well as the differences in the susceptibility to certain classes of food exhibited by even normal individuals. In a general way it may be said that a case of chronic gastric catarrh should be limited to simple and easily digested foods, or foods rendered easy of digestion by artificial means, as without such aid in many cases digestion cannot be properly performed. Even here, however, individual experience must cause the dietary to vary, for what is easy of digestion to one is difficult to another, and what the normal stomach may find easy to prepare for assimilation is difficult to the diseased organ.

In many cases of chronic gastric catarrh a diet of milk must, at least for a time, be resorted to. Although patients soon tire of it, and, as has been stated, a diet exclusively of milk is in a measure effecting a cure by slow starvation, yet in severe and obstinate cases such a strict regulation of the diet becomes necessary. The objection that such a quantity as it is possible to give a patient does not afford sufficient nutritive principles to properly maintain life upon its use alone, is counteracted by the addition to it of milk powders, consisting of milk which has been evaporated to dryness and then pulverized. It is estimated that one hundred grammes of this are the equivalent of one litre of milk; so that the addition of such a quantity to the milk

[1] *Op. cit.*, S. 203.

taken imparts to it greatly increased nutritive qualities. Milk may be administered in its ordinary state or as buttermilk, or it may be previously peptonized. In some cases the addition of Vichy water, a small quantity of bicarbonate of sodium or of common salt will render it more easy of digestion.

In cases of less severity than would call for a strict diet of milk, such a regimen may be supplemented by foods in a semi-liquid form, such as soft-boiled eggs and soups prepared in milk and thickened by thoroughly boiled rice or barley; or well-cooked oatmeal, rendered thin in consistence and carefully strained to remove the indigestible shells of the grain, may be given with advantage. We may also allow the twice-baked or toasted breads, such as zwieback, with a small allowance of butter; tender meats, prepared without fats, therefore roasted or broiled, may be rendered more easy of digestion by scraping. Care should be taken, however, that all fatty and tough portions are removed, and that the meat is not from animals that have been recently slaughtered. In a general way we may say that all meats that contain much fat, and the fatty fish foods, should be avoided, as they readily undergo decomposition in the stomach and are therefore indirectly harmful. The condiments and the concentrated alcholic liquors should be forbidden because of their irritant effects, but weak tea and cocoa may, in most cases, be allowed. After a patient has thus been dieted for several weeks a more liberal allowance of food may be given, and here it may be said that the vegetables and fruits in general are of advantage; and that bread, if well baked and not too fresh, may be allowed. It should be borne in mind, however, that these substances, on account of their saccharine constituents, readily undergo fermentation, and that they should be carefully prepared and used with caution. Especially is this care necessary in all atonic states of the stomach and when the tendency to gastrectasis exists, as in these conditions the prolonged detention of carbohydrates in the stomach promotes their fermentation.

The patient with chronic gastritis should eat more frequently than the normal individual, and at least four meals should be partaken of in the twenty-four hours. He should exercise care in mastication and should eat slowly, and as far as possible dismiss from his mind business and other cares while eating. The meals should not be too large in bulk, and under all circumstances the patient should cease eating before the appetite has been fully satisfied.

The use of mineral waters is undoubtedly of advantage in many cases of chronic gastritis. The best results are to be obtained from saline and alkaline saline waters. The former, containing small or large amounts of carbonic acid, are to be preferred in most cases of the disease. From practical experience their effect appears to be to

increase the production of the gastric secretion and to increase the appetite, as well as to influence favorably the motive power of the stomach. This class of waters is not indicated when marked gastric atony exists or where a high grade of gastrectasis has occurred.[1] In the group of saline springs belong Soden, Homburg, Wiesbaden (*Kochbrunnen*, warm), Kissingen and Sarotoga, Congress Spring.

When constipation exists as a troublesome symptom better results are obtained from the alkaline saline waters, which contain chiefly sodium sulphate, sodium chloride, sodium carbonate, and free carbonic acid gas, and the effects of which depend largely upon the sodium sulphate; of these springs the principal are Carlsbad, Marienbad, Sarotoga Hathorn Spring, Franzensbad and Tarasp.

For the earliest systematic investigations of the action of these waters in disorders of digestion we are under obligations to Jaworski,[2] whose researches were later supplemented by various other observers, notably Spitzer,[3] Ewald, and Sandberg.[4] The conclusions of these various investigators do not seem to agree. Thus, while Jaworski observed a decrease in the secretion of hydrochloric acid and pepsin after the use of Carlsbad waters, Ewald and Sandberg were unable to establish that these waters materially, if at all, decreased the amount of these substances in the gastric secretions. From an investigation of some eighteen cases Spitzer arrived at practically the same conclusions as Ewald and Sandberg. After four weeks' treatment at Carlsbad most of these cases showed an increase in the muscular power, and in none of them did a decrease in this function take place. The influence upon the secretion of hydrochloric acid was somewhat variable: in some instances it was increased and in others diminished; in cases of hyperacidity a rapid decline to the normal took place, but it did not go materially below.

The use of these waters at home, in the bottled form, may be resorted to, but it cannot be so successful as a sojourn at the springs, where the complete rest, the freedom from mental worry, the great care in diet, and the open-air life are all important aids in effecting a cure.

Hygienic conditions must be considered as tending to promote cure in cases of chronic gastritis. An abundance of exercise, especially out of doors, should be recommended; therefore bicycle and horseback exercise, as well as walking, may be resorted to with advantage. At home, when out-of-door exercise is impracticable, the swinging of clubs or the use of any of the exercising apparatus may

[1] Riegel: *Nothnagel's Spec. Path. u. Therap.*, Bd. xvi. Th. 2, S. 285.

[2] *Deutsches Archiv für klin. Med.*, Bd. xxxvii, und *Wiener med. Presse*, 1888, Nos. 3, 4.

[3] *Therapeutische Monatshefte*, April, 1894.

[4] *Klinik*, etc., Bd. ii. S. 243.

be substituted. Exercise should be carefully regulated, however, and care should be taken that it be not overdone. The condition of the skin should also be looked after, and a daily cold sponge-bath with brisk rubbing afterward with a Turkish towel will be found conducive to this end. In many instances advantage will be derived from change of air and occupation, and camping-out in the woods or a protracted sea-voyage may accomplish what the strictest regulation of the diet and the most carefully managed medication will fail to do.

Among the direct means of treating gastric catarrh, lavage, or the washing out of the stomach, will be found to be of the greatest benefit. Of all the remedies tending to increase the functional activity of the gastric secretory glands it gives the best results. Not only is secretion of hydrochloric acid and pepsin furthered by the use of lavage in this affection, but the mechanical effect of the procedure is also of the greatest benefit. No small part of the cure of this disease depends upon the removal of the thick, ropy mucus that clings to the gastric walls and mechanically impedes and interferes with the proper secretion of gastric juice. By the use of lavage this mucus is not only gotten rid of, but the nests of bacteria of various kinds which are imbedded in it, and which multiply with great rapidity, are also removed, and thus one of the most important factors in the production of fermentation is eradicated. The collection of such a mass of thick, tenacious mucus upon the gastric wall not only offers a mechanical obstruction to the pouring out of the gastric secretion, but it also interposes itself between the secretory glands and the food in the stomach. In this way the stimulating effect normally exerted upon the glands by the presence of food in the stomach is interfered with and the glandular secretion prevented.

Thus the good effects following the use of lavage are due to several conditions: the mucus with its contained bacteria is removed, and fermentative and putrefactive processes prevented; a mechanical interference with the secretion of gastric juice is gotten rid of; and the secretory and motor functions are directly stimulated. The mere presence of the water in the stomach and its impact against the gastric wall tend to increase the gastric flow, and especially is this the case when the water is forced in under pressure in the form of a douche. By this latter procedure vasomotor functions are stimulated, and by the increased activity of the circulation more blood is brought to the tissues. From these effects, unless the glandular structure is largely atrophic, the necessary sequence must be a healthy reaction. Degenerative changes are further arrested, and positive relief of the pathological conditions is brought about, by the effect of lavage upon the muscular coat of the stomach. My own experience confirms that of

others in that the effect of washing out of the stomach is to increase its tonus and to stimulate peristalsis. Under its influence, therefore, the food is more quickly advanced and its digestion hastened, thus preventing its long retention in the stomach and consequent fermentation with its tendency ultimately to produce gastrectasis.

Of the various contrivances for lavage that of Ewald is most universally employed. It consists of a piece of soft-rubber tubing about one yard in length, open at both ends, and possessing several fenestræ near the end introduced into the stomach. To the other end a large funnel of about two quarts capacity is attached. After the introduction of the tube into the stomach the funnel is placed in a wooden frame contrived for the purpose, and is then filled with the desired quantity of water. It is then elevated, the degree of elevation being regulated in accordance with the amount of pressure desired. From the various openings the water escapes with some force, and these several streams coming in contact with the wall of the stomach result in detaching the clinging mucus, and otherwise exert a beneficial effect. As soon as a feeling of distention and discomfort is experienced by the patient the further entrance of water should be stopped. This is accomplished by lowering the funnel and again placing it in the rest upon the floor, the funnel refilling from the stomach by siphonage. The wash-water may then be examined and its character determined. These manœuvres should be repeated until the returning water from the stomach is perfectly clean and free from mucus and particles of food.

Another very efficient contrivance is the Leube-Rosenthal apparatus, the use of which is strongly advocated by Einhorn,[1] and which consists of a large glass irrigator of capacity to hold two or more quarts. From this irrigator there leads a long piece of soft-rubber tubing which by means of a Y-shaped glass tube is connected both with the stomach-tube and with a second long piece of soft-rubber tubing, the latter placed in a vessel intended to receive the wash-water from the stomach. The tubing passing from the irrigator to the stomach-tube and the tubing passing from the stomach-tube to the wash-vessel are each provided with a clamp, so that by opening the clamp upon the former and closing that upon the latter the water passes into the stomach, while closing the former and opening the latter permits the wash-water to pass out of the stomach into the vessel provided for that purpose. Repeated washings should be resorted to at each sitting until the wash-water returns from the stomach free from mucus and particles of food. In order to facilitate the dislodgement of mucus from the walls of the stomach and to render its removal through the tube more ready of accomplish-

[1] *Twentieth Cent. Prac.*, vol. viii. p. 182.

ment, Einhorn advises that the patient shake himself while the water is passing into the stomach.

The same result may be obtained by following the suggestion made by Fleiner[1] that, after washing out the stomach while the patient is in the sitting position until the wash-water returns clear, the patient be allowed to lie down and the lavage further continued while in this position. As a result of this manœuvre it often happens that additional particles of food will be removed when previously the wash-water has returned perfectly clear.

In the early period of the treatment of a case of chronic gastritis lavage should be practised daily, while the stomach is presumably empty, and never, therefore, soon after the taking of a meal. For these reasons the operation is best performed in the morning before breakfast and again before retiring for the night. Of course such frequent lavage is necessary only in the severest forms of the disease, and in most cases a single daily lavage, before the first meal of the day, will prove quite sufficient. After the continuance of the treatment for ten days or two weeks the frequency of the lavage may usually be diminished, and the stomach then be washed out every other day. As the treatment progresses the frequency may be still further diminished, until finally it may be stopped altogether. While this is true of many cases, it is not true of those in which permanent and irremediable changes have taken place in the stomach-wall leading to gastrectasis. In this class of cases the daily lavage of the stomach becomes as much a part of the daily routine of the patient's life as his daily bath. Nor is its use to be regarded as a hardship, for these patients easily acquire the ability to themselves introduce the tube with facility and without inconvenience, while the alleviation of the distressing symptoms that it accomplishes more than compensates for any troublesome and disagreeable features attending its employment.

In the use of lavage care should be taken not to introduce too large a quantity of water into the stomach. It should be borne in mind that the tendency in all forms of chronic gastritis is toward atrophy of the stomach and gastrectasis. Therefore it seems to me an injurious procedure to introduce into a stomach with weakened walls, and already, perhaps, beginning to undergo dilatation, a large quantity of fluid that by its mere weight alone can only hasten the development of gastrectasis, or at least produce gastroptosis. It is by far too common a practice in such cases to keep pouring water into the stomach until the patient complains of some discomfort, a result sometimes not obtained until several quarts of water have been intro-

[1] *Volkmann's Sammlung klinischer Vorträge*, Neue Folge, 1894, No. 103. Referat. Riegel, *Nothnagel's Specielle Path. und Therap.*, Bd. xvi. Th. 2, S. 288.

duced. Such a method of conducting lavage can only tend to aggravate the condition that it was the object of the treatment to alleviate. It would appear more rational, therefore, in this class of cases to provide for the return of the water immediately after its introduction, or at least to retain a ready means of controlling the quantity in the stomach at any one time. This can be readily accomplished by means of the double tube, the water being forced into the stomach under pressure, that none of the mechanical effects of lavage shall be lost. According to my experience the combination of lavage and the gastric douche accomplished by thus forcing the water into the stomach under pressure, and through a tube provided at its end with a number of small openings, has been attended with marked success. The mucous membrane of the stomach is in this way given what is practically a needle douche, while through the return tube the mucus and particles of food pass out into the wash-vessel.

These numerous streams impinging with force upon the mucous membrane detach the mucus clinging to its surface more readily than will the ordinary method of lavage; and, what is of more importance, the effect upon the circulation cannot fail to be attended with good results. The vasomotor centres are stimulated, a better blood-supply seeks the stomach, and degenerative processes are more likely to be retarded or arrested. By this method, also, the muscular coat of the stomach must be stimulated to a greater degree than by lavage as ordinarily practised, so that peristaltic movements will be increased and the tendency to the prolonged retention of food within the stomach obviated.

In electricity we possess another important and oftentimes efficient means of treating chronic gastric catarrh, and we see frequently illustrated in practice the truth of Goldschmidt's[1] statement that the direct electrization of the stomach is not only an important means of combating the nervous disorders of the stomach, but is also of good service in those gastric affections possessing an organic basis.

While some doubt exists as to the manner in which electricity acts in gastric disorders, it is probable that its use in chronic gastritis promotes the secretion of the proper gastric juice as well as increases the activity of gastric peristalsis. The former result is accomplished by the action of the electrical current upon the gastric secretory glands through its effect upon the innervation of the organ, while the latter is brought about by the effect of the current upon the muscular coat. Thus we have relieved many of the symptoms of the disease which are dependent upon diminution or absence of hydrochloric acid, and by the stimulation of the glands to renewed activity further degenerative processes are retarded or prevented.

[1] Riegel, *Nothnagel's Specielle Path. u. Therap.*, Bd. xvi. Th. 2, S. 306.

The effect of the current upon the muscularis, and the resulting increased activity of peristalsis, can but add to the tonicity of this structure, thus preventing the too long retention of food within the stomach and preventing the development of gastrectasis to which many cases of chronic gastric catarrh tend. That the electric current thus brings about its favorable results in chronic gastritis is a mere conjecture which, whether true or not, matters little as regards the practical results; for, as Einhorn remarks in this connection, "The chief factor in determining the efficacy of any means of treatment is, and always will be, experience."

There now remains but little doubt as to the comparative value of direct gastric electrization over the introduction of the electrical current through the tissues of the abdomen, the so-called percutaneous method. By the latter method the current must be so diffused in its passage through the abdominal wall that it is doubtful if any portion of its effects arrive at the stomach, or at least these effects must be then so attenuated that but little good will result. Nevertheless, that some good follows the use of the percutaneous method has been demonstrated by many observers, and its employment in preference to direct electrization has been especially advocated by Von Ziemssen,[1] in whose opinion the results obtained by the latter method are not sufficiently great to justify the straining and exhaustion attending the introduction of the electrode into the stomach. The same observer further contends that intragastric electrization is insufficient because, owing to the left direction of the axis of the œsophagus, the electrode in its introduction is deviated in this direction and hence invariably comes in contact only with this portion of the greater curvature, and that as a result the organ is influenced only in part and not in its entirety.[2] It has, however, been sufficiently demonstrated that the introduction of the electrode into the stomach after the viscus has been partially filled with water results in the uniform transmission of the current in different directions, and that all that portion of the organ below the level of the water will be influenced. If for any reason, however, in any individual case direct gastric electrization be deemed inadmissible or inadvisable we may substitute for it the percutaneous method with the expectation of obtaining at least a considerable degree of benefit. In this procedure one electrode is placed upon the epigastrium while the other is placed upon the back near the fifth or sixth dorsal vertebra, and to the left of the vertebral column.

With the introduction of new methods in direct electrization the principal objections to the procedure have disappeared. With the older technique it was necessary for the patient to retain the stomach-

[1] Riegel, *Nothnagel's Specielle Path. u. Therap.*, Bd. xvi. Th. 2, S. 308.

[2] *Klinische Vorträge*, 1888, No. 12.

tube, through which passed the wire to the electrode, within the stomach throughout the entire séance. The effect of this prolonged retention of a thick tube in the œsophagus was to produce a great deal of gagging and straining, followed by more or less exhaustion, and for these reasons the intragastric applications of electricity met with much adverse criticism.

That internal or direct gastric electrization has been brought within the range of practical therapeutics is undoubtedly due chiefly to the experiments of Einhorn, and his invention of the device named by him the deglutable stomach-electrode. This instrument consists of an electrode about the size and shape of an almond, the component parts of which are a hard-rubber capsule possessing multiple openings and, within the capsule, a metallic button connected with a thin wire which serves as a means of communication with the battery; the wire passes through a very fine rubber tubing. The object of the hard-rubber capsule is to prevent the metallic button from coming into direct contact with the stomach, while the multiple openings in the capsule permit contact between the metallic button and the water within the stomach, and through this medium the circuit is completed.

Ewald[1] has modified the apparatus of Einhorn to the extent of running the thin wire connecting with the electrode through rubber tubing of greater thickness than that previously advocated. This, he considers, renders the instrument more ready of introduction in those persons who find the swallowing of the capsule difficult, or in whom the capsule has a tendency to lodge in the œsophagus. The size of this tubing corresponds to Carrière No. 13, and the thickness of its walls is about one and a half millimetres. With this tubing the operator is able to introduce the electrode in very much the same manner used in the introduction of the ordinary stomach-tube, and is not obliged to depend entirely upon the ability or willingness of the patient to swallow it.

Before the application of direct electrization the patient should be properly prepared, and for this all that is necessary is that he should take, upon an empty stomach, one or two glasses of water. The electrode is then introduced by passing the capsule as far back as possible upon the tongue, and the patient is then told to swallow, the deglutition of the instrument being facilitated by the patient again drinking some water. As soon as the electrode is within the stomach, a fact readily ascertained by placing a mark upon the rubber tubing at the proper point, the electricity may be applied.

The technique of the procedure is, perhaps, best explained by the following quotation from Einhorn:[2]

[1] *Klinik der Verdauungskrankh.*, Dritte Aufl., Bd. ii. S. 95.

[2] *Twentieth Century Practice*, vol. viii. p. 191.

"The patient, when the deglutable electrode is within the stomach, opens his clothes, so that the abdomen is accessible. The key of the deglutable electrode is connected with the cord (negative pole) running to the battery.

"*Gastro-faradization.*—Sitting, ten minutes; at first the large plate electrode at the gastric and epigastric region for five minutes, then a small ordinary sponge electrode. The electrode is at first moved up and down from left to right in the gastric region; sometimes, especially when there is constipation, the electrode is passed over the region of the colon—ascendens, transversum, and descendens—always beginning in the right iliac region and stopping at the left iliac region (duration, two minutes); we then proceed from the gastric region from right to left to the back, and remain at the left side of the seventh dorsal vertebra for one minute. At this place the current can be applied quite strongly, and most patients then experience a slight sensation within the stomach: the patients find it difficult to describe this sensation; some assert that they experience a dragging feeling, others a feeling of weight, and others again a feeling of pinching. All of them refer the feeling to the stomach, and locate it opposite different heights of the abdominal wall. We then return to the front, moving the electrode gently up and down over the gastric region for two minutes, gradually decreasing the current, and thus end the sitting. The current must be of such a strength that it causes distinct contractions of the abdominal walls, but it is not well to have it so strong that the patient experiences pain.

"*Gastro-galvanization.*—Negative pole within the stomach; small sponge electrode. Duration, eight minutes. First, for two minutes below the ensiform process (during first minute the current is gradually increased to its necessary strength), then for three minutes moving the electrode up and down the gastric region. After this we go to the back and remain one minute at the left side of the seventh dorsal vertebra, return to the front, move the electrode around the gastric region for one minute, and then remain quietly for one minute below the ensiform process. During this time the current is gradually weakened and the sitting is ended. The strength of current is ordinarily fifteen to twenty milliampères.

"In withdrawing the electrode a resistance is felt at the introitus œsophagi; it is not advisable to pull the electrode with force. One has only to make the patient swallow once or twice, and to make use of the moment when the larynx, by this act, ascends and the passage becomes free to withdraw the electrode, which is now done with perfect ease."

In chronic gastric catarrh direct gastro-faradization should be used in preference to the application of the galvanic current, for the reason

that its effects are to stimulate the secretory functions of the stomach and hence increase the output of hydrochloric acid. The good results obtained from the galvanic current are seen especially in the gastric neuroses, and particularly in those forms characterized by pain. The usefulness of this current in chronic gastritis, therefore, finds its best expression in those cases characterized by sensory disturbances, especially the severe gastralgias sometimes attending the affection. This difference in the effects of the two currents is especially insisted upon by Goldschmidt, who recommends the employment of intragastric galvanization (positive pole in the stomach) more for the painful affections of the stomach, while he restricts the use of the faradic current to those conditions of the stomach characterized by a disturbance of its function.

The electrical treatment of the stomach in chronic gastritis should be conducted frequently. During the earlier part of the treatment the sittings should be every other day, and should thus continue for three or four weeks; or the frequency of administration may be earlier diminished if there be a marked amelioration of the symptoms. The number of sittings may then be reduced to two weekly, and then to one weekly, and should be continued for some time after the disappearance of the symptoms.

While electricity affords us a valuable means of treating this at times very troublesome disease, there are those whose conclusions are entitled to earnest consideration who consider it inferior to other means at our command. Rosenheim, in particular, has not observed the favorable result so ardently claimed for electricity in the secretory diseases of the stomach, and believes that more can be accomplished by medication supplemented by lavage, or even by medication alone.

In considering the use of drugs in chronic gastric catarrh, our thoughts naturally turn first to hydrochloric acid. The use of hydrochloric acid in this disease is of course suggested by the character of the anatomical changes that occur, and the absence or diminution of the quantity of hydrochloric acid in the gastric secretions dependent upon these anatomical changes. Therefore, by the administration of this drug we endeavor to replace an important constituent of the gastric juice temporarily or permanently absent from it. It is important to bear in mind, however, that not every case showing a diminution of the normal quantity of free hydrochloric acid calls for its artificial replacement, as in many instances the diminution or even entire absence of hydrochloric acid will be found to depend upon the simple abeyance of the secretory functions of the stomach, and not upon advanced atrophic changes in the secreting structures. In cases of this character the indication is to stimulate the functions of the

stomach that for the time being are inactive rather than to artificially administer a substitute. The secretion from the gastric glands is rendered more efficient under the influence of a proper stimulus, and if, instead of so stimulating the function of the glands, a drug such as hydrochloric acid be administered, the demand made upon the secretory structures is lessened, and the activity with which their function is performed will be diminished. In this way we would defeat our ultimate object, as the maintenance of a proper degree of health of a tissue depends upon continued activity, while inactivity leads to atrophy and loss of function. Therefore, in this class of cases, better results are often obtained by resort to the mechanical means of treating the stomach, especially lavage and electrization, and by the administration of that class of remedies generally called the stomachics.

In those instances of chronic gastritis in which hydrochloric acid is persistently absent or markedly diminished in amount, and in which these changes are dependent upon advanced structural lesions, the administration of hydrochloric acid becomes of the utmost value. By its action stomach-digestion is materially aided and the administration of albuminous articles of diet rendered permissible. When it is deficient in the gastric contents the artificial use of hydrochloric is further indicated on account of its disinfectant and anti-fermentative properties. Under ordinary circumstances the most important feature in the prevention of fermentative processes within the stomach is to be found in the hydrochloric acid of the normal gastric secretions. In those diseases of the stomach characterized by an absence of this constituent, fermentation and decomposition of the gastric contents readily takes place, especially as then gastric digestion is much delayed and the food is retained for an undue length of time. Under these circumstances much benefit is derived from the administration of hydrochloric acid. In these cases the dose of the drug should be a large one—20 to 30 drops, well diluted—as it is difficult to conceive of much benefit arising from the ordinarily prescribed dose of 10 drops when we consider the degree of dilution it undergoes when admixed with the contents of the stomach, and if we further reflect that some forms of fermentation are not seriously interfered with by small amounts of hydrochloric acid. While hydrochloric acid is valuable for its anti-fermentative properties, it must not be forgotten that in lavage we possess a much more efficient and more certain means of combating this condition.

Riegel[1] also ascribes to hydrochloric acid the properties of a stomachic, at the same time stating that the manner in which it acts is not well understood. He advises, in order to obtain the stomachic

[1] *Nothnagel's Specielle Path. und Therap.*, Bd. xvi. Th. 2, S. 260.

effects of the drug, that it be administered about a quarter of an hour before meals instead of afterward, and in small doses rather than the large doses prescribed under other circumstances; and further states that, administered in this way, it is not uncommon to find the appetite increase and the ability of the patient to take more nourishment enhanced.

Hydrochloric acid is best administered in the form of the diluted acid usually employed. It should be given after meals in doses of from 15 to 20 drops, or more, largely diluted with water, care being taken to protect the teeth by the taking of the medicament through a glass tube. It is perhaps better not to take the entire dose at one time, but rather to divide it into three or four portions to be taken at intervals of about half an hour. In my experience the very large doses advocated by Ewald and others have proven unnecessary, and a dose of 20 drops taken three times daily in accordance with the method described should be regarded as the maximum amount required.

The digestive ferments, and in particular pepsin, were, until a recent period, largely employed in the treatment of digestive disorders, and especially in the management of chronic gastric catarrh, in which affection this ingredient is so frequently lacking from the gastric secretions. Of late, however, the use of this class of remedies has fallen into deserved discredit, for the reason that recent investigations have conclusively proven that whenever free hydrochloric acid exists in the gastric secretions, even in diminished quantities, pepsin is always to be found in sufficient amounts for the purpose of digestion. Even in those instances in which hydrochloric acid is totally lacking, and which therefore show also an absence of pepsin, there still will be present in the gastric secretions, in the vast majority of such cases, the zymogen of pepsin, or pepsinogen, from which with the administration of hydrochloric acid pepsin will be produced in abundance. The cases of chronic gastritis in which pepsinogen is absent from the gastric secretions are of very infrequent occurrence, and even in this class of cases the inutility of pepsin must be admitted when we consider the disproportion between the digestive powers of the pepsin ordinarily sold and the pepsin of the normal gastric secretion.

What is true of pepsin is also true even to a greater extent of the other digestive ferments, such as papain and pancreatin, so largely and indiscriminately employed in the treatment of disorders of digestion. It is true that when our knowledge of diseases of the stomach lacked the precision that at the present day it has attained, the use of these medicaments seemed, upon theoretical grounds at least, to be indicated. Since closer observation and the more scientific considera-

tion of the subject have proven the facts just mentioned, it seems to me that the use of the digestive ferments, at least in chronic gastric catarrh, can be abandoned with advantage, and that our efforts should be directed toward the stimulation of the secretory functions of the stomach, particularly by the physical means at our disposal.

For a long time past practical experience has demonstrated the value of the so-called bitter tonics, or stomachics, in the treatment of disorders of digestion, although the manner in which they act is still somewhat of an open question. It is claimed for some of these remedies that they directly stimulate the secretion of the gastric juice, and for others that their powers to aid digestion depend largely upon their ability to increase the motor power of the stomach, and that they thus lessen the period during which the food remains within the stomach, where the digestive function is feeble. That this class of remedies increases the appetite is a well-known fact.

We are under many obligations to Reichmann[1] for a very careful investigation of the mode of action of the bitter tonics. These researches are of more value in that they were conducted upon patients suffering from disorders of digestion rather than upon animals, as were many of the previous investigations. The results in some of the latter seemed to prove that, so far from the secretion of hydrochloric acid being stimulated after the administration of the bitters, their exhibition was actually followed by its lessening. Reichmann chose for his experiments the two groups of bitter stomachics, the simple bitters and the aromatic bitters, but no great difference in the action of the different members of the two classes of drugs could be established. He found that there follows *immediately* after the introduction of a bitter infusion into the fasting stomach less secretory activity than followed the administration of distilled water, but that after the passage of the bitter from the stomach a notable increase in the amount of hydrochloric acid occurred. The bitters appear to have no effect in stimulating the secretion of hydrochloric acid, or in increasing the digestive functions of the stomach, in those cases in which the gastric secretion is normal or nearly so. In cases, however, in which hydrochloric acid is diminished in amount or is absent altogether, provided this absence is due to a simple abeyance of function, its increase follows the use of the bitters. Of course in those cases of chronic gastric catarrh in which the pathological changes have proceeded to more or less complete atrophy and destruction of the glandular structure of the stomach, the use of the bitters is not indicated, as no secretory structure remains to be stimulated.

The bitter tonics, therefore, are to be prescribed only in those cases

[1] *Zeitsch. für klin. Medicin*, Bd. xiv.; referred to by Riegel in *Nothnagel's Path. u. Therap.*, Bd. xvi. Th. 2, S. 270.

in which the activity of the secretory glands is diminished; and, for the reason that no increase in the amount of hydrochloric acid takes place until after the disappearance of the remedy from the stomach, they must be taken about half an hour before meals.

Of course the results derived from the use of the bitter tonics, as from all measures calculated to stimulate the gastric secretions, will depend greatly upon the intensity of the gastric inflammation and the extent to which the glandular structure is capable of giving a response; and it seems to me that this fact explains somewhat the differences of opinion as to whether the bitters act favorably by increasing gastric secretion or simply by their influence upon the muscular tone. In those cases in which digestion is retarded or rendered difficult by weakened muscular activity much benefit is to be derived from the use of nux vomica or strychnine, its alkaloid, which has long been considered as possessing especial effects upon the muscular tone as well as upon the glandular activity. Of the various bitters it is my experience that the greatest benefit is to be derived from nux vomica or strychnine, and especially in those cases of gastritis of alcoholic origin. Next in efficiency I would place condurango, gentian, and quassia, although the remaining members of the group of stomachics, such as calumba, kino, chamomile, cardamom, ipecac, etc., are each of value, and one scarcely knows what influences him in choosing one rather than the other in a given case. These drugs may be given alone, but it is more usual to give several of them in combination, and such combinations as nux vomica with gentian, or with condurango and belladonna, seem to be more efficacious than the administration of the single drug.

The management of some special symptoms requires a brief mention. One of the most persistent and, at times, troublesome conditions associated with chronic gastric catarrh is constipation. In cases where the condition of the stomach will permit of it, a regulation of the diet with special consideration as to the condition of the intestines will be found of value. Therefore the use of foods containing a large proportion of residue, increasing the quantity of the intestinal contents and thereby stimulating the peristaltic movement, will be found in many cases all that is required for the relief of constipation. So also the use of fruits, fresh or stewed, prove simple and often efficacious means of overcoming this condition.

Enemata and laxative suppositories, such as those of glycerin, may be resorted to, especially in cases in which want of tone of the large bowel exists and in which hardened fæcal masses tend to accumulate in the descending portion; these measures tend to increase the muscular activity and to soften the retained fæces and render them easy of evacuation.

Among drugs, we find benefit derived from rhubarb, senna, taraxacum, occasionally mercury in small doses, aloes, podophyllin, jalap, colocynth, and cascara sagrada. Certain of the aperient mineral waters may also be used with advantage, and in some cases, where action upon the small intestines is desired, good results are obtained by resort to the saline cathartics.

To all measures for the relief of constipation the patient is only too apt to become habituated, a tolerance being thus established. No such means of relief, therefore, should be too long continued, and drugs should not be resorted to if it be possible to alleviate the condition by the more simple methods described.

So much has been said about the anti-fermentative action of hydrochloric acid and the effect of lavage in removing the products of fermentation that further consideration of the symptoms arising from fermentation and decomposition of the food in the stomach seems hardly called for. Nevertheless, in some cases lavage is impossible, and then other measures must be resorted to. For the relief of the condition in many cases a careful regulation of the diet is all that will be found necessary, and, indeed, in all cases presenting this condition the regulation of the diet constitutes an important preliminary to the administration of drugs, for when the stomach contains a large mass of fermenting and decomposing material it becomes impossible to counteract these changes without giving drugs in such doses that their tolerance by the stomach is impossible. Thus, reducing the possibility of fermentation to a minimum, we may obtain excellent results from various anti-fermentative and antiseptic remedies. Among these may be mentioned resorcin, carbolic acid, bismuth salicylate, naphthalin, beta-naphthol, etc. The best among this class of remedies, however, will be found to be thymol and creasote, and the latter will be found to be especially valuable in the chronic gastric catarrh of phthisis. These remedies may be administered one or two hours after eating, and the dose may be repeated in one or two hours, should a single dose prove insufficient to accomplish the purpose intended. In some instances fermentative symptoms are relieved by the use of antacids, especially bicarbonate of soda, administered alone or preferably in combination with bismuth. As pointed out by Ewald, however, the effect of the alkalies in this condition is one of palliation, and by their use the cause upon which the process depends is favored rather than opposed.

Gastralgia is a symptom at times requiring treatment in the course of chronic gastric catarrh. As already pointed out, this symptom in many instances may be promptly relieved by gastro-galvanization with the positive pole (Goldschmidt) within the stomach and a small sponge electrode upon the epigastrium. It must also be remembered

that many of the measures already mentioned in the treatment of the disease itself will exert a beneficial action upon this symptom should it be present; particularly is this true of lavage and the gastric douche. Among drugs I have obtained the best results from cannabis indica, sulphate of codeine, and nux vomica, especially when given in combination. I am in the habit of prescribing them in pill form, as follows:

℞. Codeinæ sulphat., gr. iij (0.18);
Ext. cannab. indic., gr. ij (0.12);
Ext. nucis vom., gr. iij (0.18).
M. et ft. pil. No. xii.
Sig. One pill to be taken three times daily after meals.

Belladonna, hyoscine, hydrocyanic acid, Hoffman's anodyne, and spirit of chloroform may also be used for the relief of this symptom. When gastralgia is resistant, however, recourse must be had to the hypodermic use of morphine for its palliation. In a chronic disease of this character, the danger of thus establishing the opium-habit must be pointed out.

Vomiting is a symptom that is best treated by lavage. It is not frequently that it demands special attention.

In the brief discussion of the etiology of chronic gastritis it was pointed out that many cases were of secondary origin, depending upon diseases of other organs, or upon some general constitutional conditions. Under these circumstances the primary necessity of relieving this condition before the gastric changes can be effected becomes apparent. Thus in hepatic cirrhosis, chronic cardiac and pulmonary diseases, and renal disease, the primary cause of the changes within the stomach must be eradicated before relief of the gastric symptoms can be hoped for. The same may be said of the chronic gastritis accompanying chlorosis and other forms of anæmia, and I have repeatedly seen marked improvement follow the administration of iron and other blood-making remedies when previous treatment of the case upon a pure gastric basis had failed.

DILATATION OF THE STOMACH, OR GASTRECTASIS.

As to what constitutes a pathologically enlarged stomach cannot always be determined by an estimation of the capacity of the organ, as wide variations in the size are found to occur in individuals who give no evidence of gastric disorder. Of the stomachs examined

post-mortem by Von Ziemssen, taken from individuals of about the same size with a view of determining a standard for the capacity of the organ in health, the largest was found to hold 1680 c.cm., while the smallest would hold but 250 c.cm. More recent investigations conducted by Pepper and Stengel[1] would show that even greater enlargement may exist and symptoms of gastrectasis be absent; thus the largest stomach of the series examined by these observers gave a capacity of 2600 c.cm.

In none of the individuals from whom these stomachs were taken had there been any digestive disturbances complained of during life. From its capacity alone, therefore, a stomach cannot be said to be pathologically dilated unless such capacity be in excess of 1700 c.cm. On the other hand, it can be readily understood that a stomach the normal capacity of which is approximately 250 c.cm. might in reality be very greatly dilated by some pathological condition, even though in capacity it did not approach the limit mentioned above. We must learn to depend, therefore, more upon the symptoms to determine the existence of ectasia ventriculi, or at least associate these symptoms with the evidences of increased capacity. To that condition in which the stomach is enlarged but in which no symptoms of dilatation are present, Ewald has given the name megastria; while the term gastrectasis is restricted to those cases presenting not only the physical signs of dilatation, but also the symptomatic evidences of functional insufficiency. Fortunately these symptoms are distinctive and leave the diagnosis in but little doubt.

Dilatation of the stomach occurs either as a result of changes primarily affecting the gastric walls, or else as the result of a mechanical obstruction at the pylorus to the passage of the stomach-contents into the intestines. Dilatation due to the first group of causes in certain rare instances develops acutely and is then dependent upon rapid overfilling of the viscus. This form is sometimes seen after eating and drinking contests, and fatal results have been recorded. Repeated and habitual overfilling of the stomach, however, may give rise to dilatation of the chronic variety, producing atony of the muscular coat by subjecting it to excessive demands. On the other hand, chronic dilatation of the stomach occurs from atony of the gastric walls incident to the chronic degenerative changes accompanying chronic inflammatory diseases of the stomach. It has already been pointed out how in chronic gastritis the tendency of the affection is toward complete atrophy of the secretory structures of the stomach, and how, from the consequent diminution or absence of the proper gastric secretions, digestion is delayed and the food retained for an undue length of time within the stomach. It has been further pointed out

[1] *American Journal of the Medical Sciences*, Jan., 1897.

that in chronic gastritis the motor power of the stomach is lessened and peristaltic movements enfeebled, and that this, added to the alteration in the secretions, tends still further to postpone the period when the gastric contents are passed into the intestines. This prolonged retention of food within the stomach, with the resulting fermentative processes and overdistention of the organ by the gases evolved, tends to mechanically interfere with the nutrition of the gastric walls and to promote their insufficiency. If these conditions could arise in a perfectly healthy organ its dilatation would probably take place; how much more, then, is it likely to occur when the gastric walls are atonic and atrophic as in chronic gastric catarrh!

Insufficiency of the muscular power of the stomach, either relative or absolute, may arise in conditions of general asthenia, the gastric muscularis in these instances simply sharing in the general atony of the muscular system at large. In this way can be explained the gastrectasis accompanying cachectic states such as cancer, profound anæmia, diabetes, Bright's disease, tuberculosis, etc. The stomach shares in the general malnutrition, its muscular power is lessened, gastric digestion is retarded, fermentation results, and as the result of the consequent overdistention dilatation develops. If, with a stomach the nutrition of which is thus impaired, the patient suffers from an abnormal appetite—as, for instance, in diabetes—it can be readily understood how aggravated the condition may become.

As Ewald has pointed out, gastrectasis may result from the weakening of the expulsive powers of the stomach by the "exclusion of a more or less sharply bounded portion of the muscular fibres of the stomach." This may be brought about by the destruction of a portion of the gastric muscle due to cancerous growth or extensive ulceration, so that complete gastrectasis occurs, or, at least there takes place a dilatation of that part of the stomach behind the obstruction offered to peristalsis by the areas in which the muscle-fibres have been destroyed.

Dilatation of the stomach is also said to occur as the result of lessening of the excitability of the nervous mechanism governing peristalsis, or paresis of the nerve-fibres presiding over the motor functions of the stomach. These conditions, as a rule, depend upon some reflex inhibitory influence, or are due to the effects of the local lesions of the stomach already dwelt upon.

The greatest degree of gastrectasis is to be found in those cases dependent upon a mechanical obstruction at the pylorus. This at once disturbs the relationship existing between the normal muscular activity and the amount of resistance normally offered by the pylorus. Consequently undue demands are made upon the muscularis, to meet which hypertrophy of the muscular coat at first takes place. As the

degree of the obstruction increases, however, and develops in excess of the ability of the gastric muscle to overcome it, stretching of the stomach-walls takes place, the individual muscle-fibres become separated, and gastrectasis occurs. The most common cause of pyloric obstruction is undoubtedly carcinoma, the pylorus being the most frequent location of gastric cancer. Another cause of common occurrence is to be found in the cicatricial contraction following the healing of an ulcer in the immediate neighborhood of the pylorus. Under these circumstances it is not necessary for the cicatrix to directly involve the pylorus, as obstruction of the orifice may be brought about by the inflammatory infiltration of the tissues in the vicinity of the cicatrix. Again, obstruction may be caused by a pedunculated polypus, carcinomatous or not, springing from the stomach-wall near the pylorus and dropping down into the pyloric orifice and producing obstruction very much as would a ball-valve. This, however, must be considered as one of the rarer causes of pyloric obstruction. Congenital stenosis of the pylorus also occurs, and may be classed among the rarer causes of gastrectasis. Stenosis of the pylorus may also be brought about by pressure from without the stomach or by its involvement in the growth of neoplasms arising in the viscera adjacent to it. Thus from tumors of the pancreas, the liver, or the gall-bladder, of the retroperitoneal glands, or the omentum, pressure may be exerted upon the pylorus occluding the outlet. The same condition is said to result from a displaced right kidney, but, as is insisted upon by Ewald, the kidney must have become fixed in its abnormal position in order that it may interfere with the passage of chyme through the pylorus. If a kidney be a wandering one its mobility is implied, a fact that would prevent it from exerting an occluding pressure upon the pylorus sufficiently prolonged to induce dilatation.

Gastrectasis dependent upon pyloric obstruction can only in the beginning be considered as due to purely mechanical conditions. It can be regarded, for instance, as only in part analogous to the dilatation of the left ventricle of the heart following aortic stenosis, because as soon as the pyloric stenosis persists for a sufficient length of time to give rise to any degree of gastrectasis the gastric contents are delayed in their passage into the intestines and fermentative processes take place. There therefore develop, in addition to the pyloric stenosis, other conditions which in themselves are no less important in the etiology of the affection.

Treatment.

The treatment of dilatation of the stomach should be directed toward checking the development of fermentative processes within the stomach, and preventing the retardation of the gastric contents by

compelling them, if possible, to pass downward into the intestines. When this cannot be accomplished the withdrawal of the fermenting stomach-contents by the stomach-tube becomes necessary. In addition, the diet must be carefully selected, while gastric digestion should be assisted as much as possible, and even at times replaced or supplemented by rectal alimentation.

To prevent fermentative processes developing in the gastric contents, various antiseptic and anti-fermentative remedies have been suggested. Among them may be mentioned salicylic acid in doses of from 5 to 10 grains, or the salicylate of bismuth in somewhat larger doses. Carbolic acid in minim doses, or creasote in doses of from 1 to 5 minims may be given several times during the course of the day. In hydrochloric acid we possess one of the very best anti-fermentatives, and it may be taken in large doses, well diluted, at frequent intervals during the day. Of all the means at our disposal, however, for arresting or preventing fermentation of the gastric contents, none compare in efficacy with lavage. By this procedure we prevent the undue retention of the food within the stomach and thus remove the condition upon which the fermentative processes primarily depend. It is in the treatment of gastrectasis that the most satisfactory results are obtained from lavage in gastric therapy. The frequency of the operation should be regulated in accordance with the requirements of each individual case; in many instances lavage twice daily will be found necessary, and then the times chosen should be the evening before retiring and the morning before the first meal. If the case require more frequent washing out, care must be taken to allow for all the time possible during which digestion of the food is likely to take place. This precaution must be exercised in any case, so that from five to seven hours should be allowed to elapse after eating before the stomach is washed out. The lavage should be continued until the wash-water returns perfectly clear, and especially is free from lumps of food or masses of mucus. As already pointed out in the consideration of lavage in the treatment of chronic gastric catarrh, by causing the patient to change from the sitting to the recumbent posture during lavage fresh surfaces of the gastric wall are brought under the influence of the irrigation, and masses of food and mucus removed that could not be reached without this variation of the usual method. At the conclusion of the lavage many cases are benefited by irrigation of the stomach by some anti-fermentative solution. Thus Einhorn recommends the spraying of the stomach with a 1–3:1000 solution of nitrate of silver; or for this purpose may be used with advantage a 3 per cent. solution of salicylic acid, or a weak solution of potassium permanganate, resorcin, naphthalin, or a 2 per cent. solution of borax.

In gastrectasis, or when a tendency to the condition exists, lavage

should be carried out with great care. It must be borne in mind that one of the most important causes of the condition is the prolonged retention and the accumulation of food within the stomach; by mere force of pressure these do much to bring about dilatation. It seems to me irrational, therefore, that in the treatment of this disease by lavage we should pour into the stomach large quantities of fluid at one time, usually being guided before the withdrawal of the wash-water by the statement of the patient that the stomach is distended to its utmost capacity. This I have frequently witnessed, and I cannot but believe that the overdistention of a stomach already greatly atonic, and its subjection to the weight of such a large body of water as is often required to fill it, must result in an aggravation of the condition we seek to relieve. Particularly is this of importance in those cases where gastroptosis exists in association with gastrectasis. I believe, therefore, that in these conditions better results are obtained by allowing only small quantities of water to pass into the stomach at a time; or, better still, that the irrigation of the stomach should be performed with a double tube in order that the wash-water should be returned as rapidly as it is passed into the stomach, so that the quantity allowed to remain in the stomach at one time may be readily regulated. This can be done and the advantage of lavage not be lost, if the end of the stomach-tube be provided with a number of small openings and the water forced in under pressure. This produces what is practically a needle douche, and these multiple fine streams impinging with force against the gastric mucous membrane effect the more ready removal of the mucus and particles of food clinging to it than does the ordinary method of lavage; as soon as dislodged these substances find their way out through the return tube. With the tube still in place the stomach may be irrigated with the selected antiseptic solution.

The effect of lavage in relieving the obstinate constipation which is present in many cases of gastric dilatation is a circumstance that has been noticed by many observers (Ewald, Kussmaul) and I have had frequent opportunities of attesting its value in this particular. Lavage is of the utmost importance as a remedial agent in the treatment of gastrectasis; in many instances an actual cure may result from its use, although, unfortunately, in a large group of cases, particularly those dependent upon a true stenosis of the pylorus, the results are but palliative. Even in this group of cases, however, the relief afforded to the distressing symptoms is a striking one.

Massage of the stomach acts beneficially in some cases by forcing the gastric contents into the intestines. It is obvious, however, that this can be regarded only as a procedure supplementary to lavage, and it is attended by the possible ill effects of driving into the intestine substances that cause irritation of its mucosa because they are

too highly acid to be neutralized by the intestinal secretions. The method is applicable only to those cases of dilatation arising from benign stenosis of the pylorus, and to those cases due to causes other than pyloric obstruction.

Gastro-faradization, both by the intragastric and the percutaneous methods, has proven of advantage in the treatment of this condition. Particularly is this true of the former, although the application of this agent should be restricted to those cases of dilatation that are due to atony of the muscular coat of the stomach, with its consequent relaxation; it is of but doubtful advantage in those cases dependent upon stenosis of the pylorus. The direct application of the faradic current to the stomach stimulates the muscular coat to renewed activity and hastens the expulsion of food into the intestines, thus attaining the object at which all are our efforts are aimed in the treatment of this troublesome disorder.

The use of drugs, other than for special indications, is somewhat limited in the management of dilatation of the stomach. In cases attended by marked atony of the muscular coat the use of strychnine, or nux vomica, continued over a long period of time, has given beneficial results. When severe pain or gastralgia is of frequent occurrence much benefit may be derived from the intragastric administration of the galvanic current in the manner already described. Or for this symptom sedative remedies may be resorted to, such as cannabis indica, chloral, cocaine, and morphine; good results are also said to be obtained by the use of bismuth in large doses suspended in water. When hyperacidity exists the administration of alkalies is called for.

Constipation is a symptom requiring attention, and for its relief saline and other active cathartics may be resorted to. The use of this class of remedies is not only of benefit as affording relief from this symptom, but it has been shown that their action is to excite gastric peristalsis and thus hasten the evacuation of the stomach-contents. Again, the tendency to constipation may be relieved by the employment of enemata; large rectal injections of water possess the additional advantage of allaying the excessive thirst which is often such a troublesome symptom, and, by supplying the tissues with the fluids which the dilated condition of the stomach renders slow of absorption, they increase the amount of urine voided; this excretion is often markedly diminished in gastrectasis.

The regulation of the diet is of the first importance in the management of dilatation of the stomach. The quantity of food allowed should be as limited as practicable, and fluids of all kinds are in general to be entirely cut off, or given in very small amounts. All foods that readily undergo fermentative changes are obviously to be avoided. It is evident, therefore, that all starchy foods and articles of diet con-

taining sugar are to be proscribed; fatty substances, also, which when unduly retained within the stomach undergo decomposition, are not to be partaken of. The nourishment allowed a case of gastric dilatation should consist of foods chiefly of an albuminous nature, given in the most concentrated form possible. The various preparations of peptonoids now so largely manufactured, and some of which are so valuable as nutrients, will be found serviceable in this condition. So also meat-juices, meat-powders, peptonized milk, and articles of a like nature constitute the class of nourishment upon which reliance must be placed. As the amount of food given at any one time must be strictly limited it is evident that the frequency of its administration must be adequate to the demands of the tissues. In many cases gastric alimentation must for a time cease altogether, or be reduced to a minimum; in these cases the resort to rectal feeding becomes necessary; and in any event much advantage is obtained by supplementing the gastric assimilation by nutrient rectal enemata.

CANCER OF THE STOMACH.

The relative frequency of gastric cancer, as compared with cancer attacking other portions of the body, would seem to be conclusively demonstrated by the statistics collated by Welch from various sources and embracing the enormous number of 31,482 cases. These statistics show that cancer of the stomach occurs next in frequency to cancer of the uterus, the most common of all locations of cancer; the stomach being involved in 21.4 per cent. and the uterus in 29.5 per cent. of the cases. On the other hand the statistics of Virchow, embracing the cancerous affections occurring in Würzburg between the years 1852 and 1855, show that the stomach was involved in 34.9 per cent. of the cases, while in only 19 per cent. was the uterus attacked. Welch's cases, however, include Virchow's statistics, and the higher percentage which the latter show in favor of the stomach is counterbalanced by other series of cases in which the proportion with which these two organs are involved is practically reversed. It is only by the analysis of such a large series of cases as that brought together by Welch that conclusions which are approximately definite may be reached, as comparatively small series of cases may show with varying frequency the involvement of one or other of these organs in excess of the other.

While a common disease in this country, statistics would seem to prove that gastric cancer is rather more prevalent in Europe. Thus the statistics of New York City from 1868 to 1882 inclusive, as ana-

lyzed by Welch, show that the ratio borne by cancer of the stomach to all causes of death, at all ages, is about 0.4 per cent.; and even if only the deaths from upward of twenty years of age be taken, the ratio does not exceed 1 per cent. On the other hand the statistics of Halbertin, taken from all parts of Switzerland, show the death-rate from gastric cancer to be nearly 1.9 per cent., varying from 3 per cent. in the northern to 1 per cent. in the southern part.

The part played by sex in the predisposition to gastric cancer would seem to show, according to the statistics, that more males than females are affected. The statistics of Welch show that the ratio of males to females is about 5 to 4; or, in other words, of the 2214 cases subjected to analysis from this standpoint, 1233 occurred in males and 981 in females. In Brinton's collection of 784 cases, 440 were in males and 344 in females. From a small series of 46 cases that I have taken from the records of the Jefferson Medical College Hospital, it was found that 36 occurred in males and 10 in females. While the above figures show a greater liability of the male sex to gastric cancer, it must not be overlooked that these statistics are taken largely from hospital records, and the larger percentage of males thus shown would be susceptible of explanation from the fact that, as a general rule, these hospitals are more largely attended by males than females.

The age at which gastric cancer occurs is shown by the following table, comprising 2038 cases collected by Welch from various sources:

Age	10–20	20–30	30–40	40–50	50–60
Number of cases	2	55	271	499	620
Per cent.	0.1	2.7	13.3	24.5	30.4

Age	60–70	70–80	80–90	90–100	Over 100
Number of cases	428	140	20	2	1
Per cent.	21	6.85	1	0.1	0.05

In the small series of 46 cases from Jefferson Hospital the frequency of cancer of the stomach during the various decades is shown to be as follows: Twenty-five to thirty, 2; thirty to forty, 10; forty to fifty, 10; fifty to sixty, 18; sixty to seventy, 5; seventy to seventy-five, 1. These figures are principally interesting from the fact that even in such a small series of cases a close correspondence exists with the very large series analyzed by Welch. In both it will be seen that about three-fourths of all the cases are to be found between forty and seventy years of age, and that the decade during which the greatest number of cases occurs is between fifty and sixty years of age. Nevertheless, considering the number of those living between sixty and seventy years of age, the mortality from gastric cancer is probably as great during that period of life. At least, such a deduction

may be drawn from an analysis of statistics including a large number of cases.

Analysis of other statistics, as of those collected by Brinton and by Lebert, although in each a much smaller number of cases is included, simply gives results confirmatory of the conclusions to be drawn from the large number of cases brought together by Welch. It would seem, therefore, that the predisposing influence exercised by age to gastric cancer is conclusively set forth by this table. The occurrence of cancer of the stomach under the twentieth year of age is to be regarded as extremely rare; in the series above quoted it occurs in but 2 at this period of life. Matthieu[1] has subjected to analysis all the cases of gastric cancer occurring under thirty-four years of age, and found that the total number recorded in literature at the time of his inquiry (1884) was but 27. Of this number but 3 occurred under the twentieth year.

Pre-existing local conditions have been thought to exercise an important influence in the predisposition to the disease. That traumatism to the epigastric region plays a part of any importance in the predisposition to the affection is a view that is probably not tenable. The frequency with which such a circumstance is held responsible, especially by the patients themselves, for a subsequently developing cancer, is probably owing to coincidence, and in many of such cases the probability is that the growth had existed before the injury in a latent form, so far as symptoms are concerned, and the injury did no more than draw attention to the seat of injury.

That chronic inflammations of the gastric mucous membrane predispose to gastric cancer was a view long held, but without adequate proofs. While, of course, some instances of the disease occur in an organ already the seat of a chronic gastric catarrh, there are but few facts that can be adduced to prove that such was the cause of the growth. On the contrary, it is surprising how small is the proportion of cases of cancer of the stomach that give a history of long-continued indigestion preceding the development of the growth and the symptoms characteristic of it.

That chronic ulcers of the stomach, either open or cicatrized, predispose to the disease may be regarded as an established fact. Those ulcers of long standing with thickened and indurated edges, and in which it seems impossible for complete cicatrization to take place, are most likely to subsequently show a cancerous degeneration. Various observers, Meyer,[2] Hauser,[3] Heitler,[4] have reported undoubted in-

[1] *Du Cancer précose de l'Estomac*, Paris, 1884. [2] *Inaug. Dissert.*, Berlin, 1874.

[3] *Das chronische Magengeschwür*, Leipzig, 1883.

[4] "Entwicklung von Krebs auf Narbigen-grunde im Magen," *Wiener med. Wochenschr.*, 1883, No. 31.

stances in which the secondary development of carcinoma has taken place in the cicatrix, or in the thickened margins of a gastric ulcer. Various other influences have at times been thought to predispose to gastric cancer, but there are no facts to warrant the assumption that such conditions as depressing influences, mental worry, disappointment, anxiety, or grief can in any way affect the predisposition to the disease.

The influence of heredity in the causation of gastric cancer is a question that belongs to the consideration of cancer in general rather than to the purposes of the present article. Very great variations exist in the conclusions arrived at by different observers as to the frequency with which, in instances of cancer, a history can be obtained of other members of the family having been affected by the disease. Welch places it as high as 14 per cent., while Lebert gives 7 per cent., and Halbertin 8 per cent.

The parasitic theory of the causation of carcinoma is one against which, at the present time, the verdict of "not proven" will have to be rendered. The fact that favorable results have been obtained in the treatment of sarcoma, as well as carcinoma, from the use of the blood-serum of horses which have been treated by the coccus of erysipelas, would seem to point to the origin of this disorder as being parasitic. The conclusive proofs, however, are wanting, and we are still in the dark as to the actual origin of cancer.

Treatment.

Unfortunately the treatment of cancer of the stomach is limited to the management of symptoms and to the prolongation of the life of the patient by the use of palliative measures. We possess no drug, nor method of treatment, that in any sense can be regarded as specific or curative in action. While this is entirely true, several drugs have at various times been loudly proclaimed as possessing positive curative powers in this disease. Although this is not in any sense to be regarded as established, yet several of these remedies have at least the power of modifying the prominence of certain symptoms, of rendering the patient more comfortable, and even, I am convinced, in some cases at least, of prolonging life.

One of the most conspicuous examples of this class of drugs is to be found in condurango, a remedy that originally owed its popularity to its introduction by Friedreich of Heidelberg, in 1874, as a specific against cancer. While not acting in any way as was first claimed, it is beyond doubt that condurango is an excellent stomachic, and it acts beneficially in gastric cancer by its favorable influence upon the accompanying gastric catarrh, and in the same way as it is found to act when administered in a chronic gastric catarrh of primary origin. Condurango may be given in the form of a decoction which, according to Fried-

reich's directions, is prepared by macerating half an ounce of condurango bark with twelve ounces of water for twelve hours, and then boiling down to six ounces and straining; of this the dose is a tablespoonful three times daily. It is more usual, however, in this country to administer the fluid extract of condurango, in doses of 20 or more drops, three or four times daily.

Einhorn[1] has recommended the internal use of methyl-blue in cancer of the stomach, and states that by its employment in 8 cases of cancer affecting either the stomach or the œsophagus, a great improvement in most of the symptoms took place in 3. In one case a tumor of considerable size which had occupied the gastric region apparently became somewhat smaller after about three weeks' use of the drug. In this instance the patient continued the use of the remedy uninterruptedly for about nine months, with the result that during that time there was complete freedom from pain and an apparent arrest in the growth of the tumor. Subsequent to this, however, the symptoms in an aggravated form returned, the tumor commenced to grow, and death shortly occurred.

I have had but little experience with methyl-blue, and cannot, therefore, attest its worth; it is best administered in capsules in doses of about 3 grains twice daily. With the use of condurango my experience has been much more extensive, and I believe it to be of advantage in the treatment of the disease, not as a specific but in the manner above indicated. I am in the habit of following the advice of Ewald, and giving in conjunction with condurango hydrochloric acid, as this ingredient of the gastric juice is always absent or greatly lessened in gastric cancer.

Apart from the use of these drugs, which may be said to be given on account of their influence in modifying the course of the disease, the medical treatment of gastric cancer is purely symptomatic. Pain is present in all cases at some period of the disease; it was a symptom calling for treatment in all of the 46 cases taken from the Jefferson Hospital records. To alleviate the patient's suffering cocaine may be used, although it is of doubtful efficacy. Of much more benefit is chloral hydrate, particularly for the distress arising from the decomposition of food or from the extension of ulceration. Its effect is sedative, but in some cases, as Ewald has pointed out, its local action cannot be taken advantage of because of the predominance of its hypnotic properties. It is best given in solution, in doses of about 7 grains every two or three hours. While these drugs, as well as other milder sedatives, are of advantage in the earlier stages of the disease, sooner or later recourse must be had to opium, or one of its derivatives, to relieve the patient's sufferings. Nor need the fear of

[1] *Deutsche med. Wochenschr.*, 1891, No. 18.

instituting the opium-habit deter us from the administration of the drug in sufficient quantities to afford the required relief. Opium itself may be administered in the form of suppositories or taken internally in the form of pills, the latter being preferable, as some effect is to be expected from the local action of the drug. There are objections, however, to the use of opium that apply in a much less degree to its derivatives, morphine and codeine, especially the latter. The principal objection is that it tends to still further paralyze the already sluggish intestinal peristalsis. It is better, therefore, to administer morphine or codeine in doses sufficiently large to quiet the pain, and always if possible by the mouth, in order to secure their local analgesic effects. Belladonna, or atropine, may be added with advantage, as its action tends to counteract the constipating effect of the opium.

Vomiting occurred in 42 of the 46 Jefferson Hospital cases. The persistence of this symptom depends somewhat upon the location of the lesion. I have seen cases, notably one of diffused carcinoma at the Philadelphia Hospital, in which almost the entire gastric wall was involved in the growth, and in which vomiting was absent during the entire course of the disease. In the particular instance referred to, and this is usually the case, the orifices of the stomach were but slightly implicated. The symptom is frequently relieved by the use of opium or morphine, given internally or hypodermically. In many instances it is only necessary to administer small pieces of ice, with a dash of brandy or a few drops of chloroform; small quantities of carbonated water, iced, and frequently repeated, will also prove of use; in the same way champagne may be employed. At times I have controlled this symptom by the use of equal parts of Vichy water and milk, rendered very cold, and taken in small amounts at frequent intervals. In addition, in the way of drugs, may be tried hydrocyanic acid, creasote, carbolic acid, or chemically pure oxalate of cerium. In those instances in which the vomiting results from the stagnation of food in the stomach, especially when the lesion is pyloric in location, and the contents of the stomach have become fermented and decomposed, the best relief is afforded by lavage performed in the manner already described under the treatment of gastrectasis.

Hæmatemesis, though frequent, is not often an urgent symptom; it occurred in 33 of the Jefferson Hospital cases. By the nature of the lesion the blood-loss is rarely very great, and usually consists in the ejection of the characteristic coffee-ground material. When large, it is best controlled by the use of cold, applied locally to the epigastrium and taken internally in the form of cracked ice. In addition we rely upon rest and the administration of opium and ergot, maintaining the patient's nutrition by rectal feeding.

Constipation is to be relieved by the mild vegetable aperients, or by rectal injections, or glycerin suppositories; the salines are avoided, as they unnecessarily add to the patient's exhaustion. Diarrhœa should be controlled by opium given by the rectum as suppositories, or in the form of small enemata of starch-water and laudanum.

The *diet* in gastric cancer is to be regulated with the view of maintaining the nutrition of the patient as long as possible. The dictum of Trousseau is that, in the selection of the particular articles of food, the patient should be referred to his own experience. Bearing this in mind, the important point to be considered is that the more nourishment the patient can take and assimilate the more prolonged will be his life. Owing to the diminution in the secretion of hydrochloric acid, meat and other foods of an albuminous nature are not well borne, and the patients are found to do better upon a diet of starches and vegetables. Meats, however, that are prepared in such a way as to render them easy of digestion may be advantageously given. In this way, meat well scraped and given raw or broiled may be assimilated. Milk predigested, matzoon, koumyss, kefir, and the various peptone preparations are to be relied upon in many cases. Somatose, Leube's beef-solution, Kemmerich's peptone, Mosquera's beef-jelly, or a good beef-peptone will serve as examples of this class of foods. In addition, raw or soft-boiled eggs, the white meat of fowl, fish foods, and a small quantity of well-baked or toasted bread may be used to vary the dietary. Soups made of leguminous flour, and weak tea or coffee, are admissible in most cases. Fatty substances, on account of their liability to undergo decomposition when their stay in the stomach is prolonged, are to be prohibited. So also are those liquors in which fermentation has been incomplete, and which still contain a large proportion of fermentable substances. Foods of all descriptions are to be rendered as fine as possible, and all substances containing a large amount of dense connective tissue or that are encased in tough coverings are to be avoided. In the later periods of the disease the choice of foods becomes extremely limited, and it is then usually necessary to be governed by the previous experience of each individual case.

The employment of mechanical measures for the relief of gastric cancer is a subject more properly discussed in surgical treatises, and even their brief consideration is not called for in the limits of the present article.

GASTRIC ULCER.

A NUMBER of factors seem to influence the liability of an individual to become the subject of peptic ulcer; and while any one condition cannot as yet be said to be the positive and definite exciting cause of the affection, it is probable that it arises from one or more of several conditions. That the disease is of great frequency is conclusively proven by the extensive statistics of Welch and Brinton, both of whom agree in the statement that ulcer of the stomach, cicatrized or open, is to be found in about 5 per cent. of persons dying from all causes. While this represents the post-mortem frequency with which gastric ulcer, or the evidence of its previous existence, is found, its clinical manifestations are not met with in anything like the same degree of frequency. Welch himself calls attention to the fact that the statistics relating to cicatrices are not as trustworthy as those relating to open ulcers, as it is not always possible from the character of the cicatrix to determine positively that its original cause has been a peptic ulcer, and not a loss of substance arising in some other way. Nevertheless, the statistics relating to open ulcers alone show that they are to be found in from 1 to 2 per cent. of persons dying from all causes, a figure that is still greatly in excess of the frequency with which the disease is encountered clinically. From the figures given by Lebert [1] it would appear that gastric ulcer occurs clinically in about 6 out of every 1000 cases treated for general diseases; thus, out of 41,688 cases coming before him between the years 1853 and 1873, the clinical diagnosis of gastric ulcer was made in 252 cases.

The frequency with which gastric ulcer prevails seems to vary in different regions; for Munich it is placed by Nolte at 1.23 per cent., for Berlin the frequency is placed by Berthold at 2.7 per cent., while Griess gives 8.3 per cent. for Kiel, and Stark 13 per cent. for Copenhagen. Inasmuch as gastric ulcer is to be ascribed, in part at least, to local irritation of the gastric mucosa, the varying frequency with which the disease is encountered in various localities is to be accounted for by the variations in the mode of living and the character of the food in general partaken of in different places. Of particular interest from this standpoint have been the investigations of Von Sohlern [2] which have shown that in certain parts of the Rhön mountains and the Bavarian Alps, as well as in the greater part of Russia, gastric ulcer is rarely met with. This apparent immunity from the disease he ascribes to the fact that the inhabitants of these regions live almost exclusively upon a vegetable diet, the particular effect of which is

[1] *Krankheiten des Magens*, Tübingen, 1878, S. 196.

[2] "Der Einfluss der Ernährung auf die Entstehung des Magengeschwürs," *Berl. klin. Wochenschr.*, 1889, No. 14.

that a larger amount of the salts of potassium is added to the blood than under a mixed diet. As the red blood-cells are the chief carriers of potassium, Von Sohlern asserts that the increased quantity of this substance constantly added to the blood is to be regarded as the cause of the relative immunity from ulcer possessed by vegetarians. Upon this hypothesis he advises, as a prophylactic measure against ulcer, a diet rich in vegetable matter and the administration of potassium salts.

As to the predisposing influence exercised by sex and age, the various statistics seem to be agreed. All statistics show that the disease occurs more frequently in the female than in the male, the proportion being nearly as two to one. Welch found the proportion to be 2 males to 3 females, his analysis including 1699 cases. I have collected from the records of the Jefferson Medical College Hospital 55 cases of gastric ulcer that have been treated there during the last few years; of these, 15 occurred in the male and 40 in the female sex.

As regards age in its influence upon the development of the disease, while the affection has occasionally been met with in early childhood we may regard that period of life, up to the tenth year or a little older, as practically free from liability to the disease. Between the ages of twenty and forty gastric ulcer is most common, while its mortality is probably highest between forty and sixty years. From Welch's statistics three-fourths of all the cases are found to occur between the ages of twenty and sixty. The decade during which the largest number of cases is found is between twenty and thirty years; this is particularly true of the female sex, the larger number of males developing the disease during the subsequent decade, from thirty to forty years. Analysis of the 55 cases at Jefferson Hospital with particular reference to age shows that the disease prevailed at the various ages as follows: Ten to fifteen, 1; fifteen to twenty, 6; twenty to thirty, 24; thirty to forty, 16; forty to fifty, 4; fifty to sixty, 4. Of course such a series of cases is too small for the drawing of definite conclusions, but it is interesting for the reason that it coincides with the main features of those statistics that include a larger number of cases.

That occupation plays an important part in the predisposition to gastric ulcer is a question that admits of some doubt. Nevertheless, the prevalence of the disease among individuals following certain occupations is a subject that has excited attention since the early period of our knowledge of the disease. It is thus found that housemaids, female cooks, and needle-women show an apparent tendency to the affection. Likewise those whose occupation necessitates a more or less continuous pressure upon the epigastrium appear to be thereby predisposed to gastric ulcer; such individuals,

for instance, as shoemakers, weavers, and, because of the posture that they habitually assume, tailors. Gastric ulcer occurs in association with various other diseases, especially with menstrual disorders, chlorosis and anæmia, and the relationship, to a certain extent at least, is doubtless a causal one.

The exact etiology of gastric ulcer, however, is as yet involved in some obscurity. Efforts have been made by various investigators to elucidate the subject by experiments upon animals. Lesions of the mucous membrane of the stomach have been produced by the artificial production of emboli brought about by ligating small vessels; by causing hæmorrhages through injury to certain parts of the central nervous system; or by directly subjecting the gastric mucosa to the influence of certain chemical or other irritants. The loss of substance resulting from any of these procedures, however, does not conform to the characteristics of the gastric ulcer, the tendency of which is to spread, and to cicatrize but tardily. The investigations of Griffini and Vassale proved that the mucous membrane under these circumstances is rapidly replaced—even the true peptic glands being formed from the superficial epithelium first covering the wound. So rapidly does this healing process take place that in from ten to fifteen days not a trace of the injury will remain. From the results of these experiments it would seem that a simple loss of substance is not sufficient to cause the chronic ulcer, to produce which it appears to be agreed there must be, in addition to the local lesion, some associated influence; namely, "A disproportion must exist or be created between the secretions of the gastric glands and the nutritive blood, either synchronous with or previous to the appearance of the local lesion" (Ewald). The following experiments would seem to confirm this theory: By producing gastric hæmorrhages as the result of section of the spinal cord, and then introducing into the stomach a $\frac{1}{2}$ per cent. solution of hydrochloric acid, Koch and Ewald[1] were enabled to produce deep ulcers in the stomachs of animals. Quincke and Daettwyler[2] made the animals anæmic by venesection, and Silbermann[3] disintegrated the corpuscles and produced hæmoglobinæmia by the introduction of substances into the circulation, and in both instances the artificially produced lesions healed very gradually and presented an appearance similar to that of real ulcer. In one of Silbermann's experiments the lesion failed to heal at all, and perforation occurred. If gastric ulcer developed after all lesions of the gastric mucous membrane in which a loss of substance occurred, the disease would be even much more frequent than it is. On the con-

[1] Ewald, *Klinik*, etc., 1. Th. 3. Aufl. S. 122.
[2] Quincke u. Daettwyler, *Correspondenzbl. f. Schweizer Aerzte*, 1875, S. 101.
[3] *Deutsche med. Wochenschrift*, 1886, No. 29, S. 497.

trary, innumerable and striking instances are on record in which the gastric mucosa has suffered severe injury without a true ulcer developing. Indeed, it is almost the rule in such cases, as in the experiments upon animals above quoted, that rapid healing takes place. Nevertheless, occasionally true ulcer develops subsequently to a traumatism, as in one of the cases referred to by Welch and reported by Williams.[1] The case was that of a boy who drank some strong mineral acid, and after three or four days of suffering apparently fully recovered. Two months afterward, however, sudden death occurred from the perforation of a gastric ulcer.

The theory advanced by Virchow that there exists an important relation between diseases of the heart and blood-vessels and gastric ulcer is applicable to only a limited number of cases. Virchow held that the ulcer resulted from embolism or thrombosis of a nutrient artery supplying a certain part of the mucous membrane, and that the resulting infarct was acted upon and destroyed by the gastric juice. That this theory explains the occurrence of the disease in certain instances only is proved by the fact that gastric ulcer occurs in individuals not the subjects of cardiac disease; that the affection occurs most commonly between the twentieth and fortieth years, and therefore at a time of life when vascular lesions are not common; and the further fact that the evidences of arterial thrombosis or embolism in the vicinity of the ulcer are not to be found in many cases.

The fact that hydrochloric acid is with but few exceptions present in the gastric juice in cases of ulcer, and the further fact that it is almost always present in excess, have served as a basis for the theory that this is the most important etiological consideration in the production of the disease. That there are exceptional cases, however—and Einhorn has cited two very striking instances—in which hydrochloric acid is not only not in excess but is actually absent from the gastric juice, serves to prove that hyperacidity, though without doubt the most frequent, cannot be regarded as the only cause of gastric ulcer. Einhorn is right in concluding, therefore, that gastric ulcer is not always produced by one and the same factor.

Treatment.

The successful treatment of gastric ulcer must meet the following indications: The stomach must be placed as far as possible at complete rest; existing hyperacidity must be corrected, if necessary by special means; the state of the blood, anæmia, chlorosis, etc., must be improved; and symptoms must be relieved.

The first indication is complied with by putting the patient to bed

[1] *The Lancet*, April 9, 1842.

and by the careful regulation of the diet, or the withdrawal for a time in certain cases of all alimentation by the stomach and resort to rectal feeding. In other words the patient is put upon the rest-cure, a method of treating gastric ulcer to which Leube[1] and Von Ziemssen[2] first called particular attention, although the treatment had previously been carried out in England by W. Fox[3] and B. Forster. Under this treatment the patient is placed at rest in bed, a dietary such as will make the least demand upon the stomach is selected, and is supplemented, or replaced if necessary, by rectal alimentation; to lessen irritation and to relieve pain, the application externally of moist heat over the upper abdominal area is also added. The treatment continues for two or three weeks, and longer if necessary. The diet is to be liquid, of which milk constitutes the basis to-day as it has ever since its use was first recommended by Cruveilhier, who also gave us the first careful and systematic description of the disease. Milk may be administered alone, or its tolerance by the stomach may be rendered more ready by the addition of lime-water, strained oatmeal, or barley; or by the addition of an equal quantity of Vichy water, a method of administration to which I am particularly partial, especially when the stomach is in a very irritable state. At this period of the treatment, also, the diet may be varied by the use of one of the reliable peptone or peptonoid preparations now so readily available.

Nourishment should be administered frequently during the first week of treatment, in small amounts at a time, and should be partaken of slowly. Thus, from four to five ounces of either of the foods just mentioned may be given the patient every hour. No change should be made in the character of the food until the third week, excepting that during the second week of treatment the quantity of food at each feeding should be increased and the frequency of its administration diminished to every two hours. During the third week the diet is supplemented by the use of leguminous soups, and later by vegetables of a like character; now we may give well-boiled rice, raw or soft-boiled eggs, tapioca, farina. From these the diet gradually changes to that ordinarily partaken of, beginning with meat that has been well scraped and given at first raw, later broiled. In the subsequent daily diet of the patient it is of course important to exclude foods that place too great a tax upon the digestive powers of the stomach. The regimen prescribed by Von Ziemssen and Leube also directs the removal, at the beginning of the third week, of the moist applications that have up to this time been continuously applied to the epigastrium, usually in the form of flaxseed poultices; and it further allows the patient at this time to begin sitting up, the

[1] *Magenkrankheiten*, S. 117. [2] *Volkmann's Samml. klin. Vorträge*, No. 15.
[3] *Reynolds' System of Medicine*, vol. ii. p. 944.

length of time being increased each day, so that during the fourth week he may be allowed out of doors.

This system of rest-cure, carried out in its completeness, also includes a "Trink-Kur" in the form of hot Carlsbad water or a solution of Carlsbad salts, taken twice daily, morning and evening, the latter just before retiring. This addition, however, constitutes no very important part in the successful treatment of gastric ulcer, as the great majority of cases get along quite as well without the Carlsbad salts.

In very many cases of ulcer it is necessary to give the stomach a complete rest for a few days, maintaining nutrition by the resort to rectal alimentation. Indeed, I believe it to be a good practice in all cases presenting symptoms of a decided character to institute this method of feeding, and rest the stomach for three or four days. In cases of marked severity I have frequently in this way rested the stomach for periods varying from ten days to two weeks, this long continuance having been rendered necessary by hæmatemesis, or frequent vomiting without blood, and by excessive pain. It is usually my practice in this class of cases not abruptly to stop rectal feeding as soon as the stomach begins to take food, but so to arrange the dietary that as stomach-feeding is increased in activity rectal feeding is correspondingly diminished. In this way any sudden strain upon the stomach by the demands of digestion is avoided, a condition not unlikely to arise when the organ which has been fasting for five days or more is at once called upon to meet the necessities of nutrition. The nutritive enemata should not be over five or six ounces in quantity, and may consist of milk rendered alkaline by the addition of a small quantity of common salt, and into which one or two raw eggs may be broken and well beaten. Instead of the egg a half-ounce of peptone may be added to the milk, or the enema may consist of peptone and water instead of milk. I believe, in those cases where rectal feeding should be maintained for so long a period as five days and when we must depend upon it solely to maintain nutrition, that it is better to employ the injections more frequently than is usually deemed necessary. It is important in the treatment that the patient's strength be maintained, that not too much flesh be lost, and that the quality of the blood be rendered as high as possible, as all these conditions must have an influence in hastening healing of the ulcer. For these reasons it is my opinion that nutritive enemata should be given at least five times during the course of the day. While rectal feeding is in progress the patient's comfort is enhanced, and the quietude of the stomach not interfered with, by the occasional administration of small pieces of ice or occasional sips of Vichy water.

In cases where hyperacidity exists, and these are in the majority,

it becomes necessary to neutralize its effects. If it be true that this condition has much to do with the production of an ulcer, it is important, in order that a cure may be effected, to reduce to a minimum this causal factor. Of course this is accomplished by the rest which we impose upon the stomach and the character of the diet subsequently administered, for the neutralizing effect of milk upon acids has been well established. Nevertheless, in many cases these measures will not prove sufficient, as the continuance of pain, vomiting, and acid eructations would to a certain extent indicate; it then becomes necessary to order the systematic and frequent administration of an alkali. For this purpose no better preparation than bicarbonate of sodium can be given, alone or in combination with other alkaline salts. It is administered by Ewald in combination with rhubarb and sugar, to obtain by the former a gentle action upon the bowels, while the addition of sugar has been recommended on account of its pain-quieting qualities. Thus:

℞. Magnes. ust.,
Sodii carbonat.,
Potassii carbonat., āā. gr. lxxv (5.0);
Pulv. rhei, gr. cl (10.0);
Sacch. lactis, ʒvij (28.0).—M.
Sig. As much as will rest upon the point of a knife, dry on the tongue, every hour.

As soon as the patient's condition shows signs of improvement, and the gastric irritability is sufficiently allayed to allow the return to a more ordinary dietary, we must meet the indication to improve the general nutrition. The frequency with which the state of the patient's blood seems to act as the basis for the chain of events resulting in gastric ulcer must be borne in mind. In many cases of anæmia and chlorosis, as well as associated with menstrual disorders, it is not unusual to find a hyperacid state of the gastric juice, and, it matters not whether the blood-condition be the cause or the effect, its correction is demanded as early as possible.

The remedies upon which we rely to accomplish these results are iron and arsenic: iron when the condition of the blood is one of decided anæmia, arsenic when a more general effect upon the system at large is desired; the two, however, are administered in combination with decidedly advantageous results. It matters not what particular preparation of iron is used if its assimilation is secured. I am extremely partial to the pepto-mangan as prepared by Gude; I have found this preparation to possess but little disturbing effects upon the stomach and that it has but a slight tendency to cause constipation.

Ewald strongly endorses the use of the chloride of iron, as one of the most easily assimilated preparations. Arsenic is best employed in the form of arsenous acid, and should be given in increasing doses. The use of these drugs should be continued for months, the arsenic, as stated, in increasing doses, with occasional periods of rest from its use; after each interval of rest the dose to begin with should be the minimum one and then gradually increased for three or four weeks; while after this period its use should be discontinued for a few days, in the way mentioned above.

Not every case of gastric ulcer is in such circumstances that the rest-cure as above outlined can be followed out. These individuals have to be treated as "ambulatory" cases, and this is the class to which the use of bismuth and nitrate of silver is especially applicable. Bismuth has for a long time proven itself of great advantage in various gastric disorders, especially those attended with pain. In the treatment of gastric ulcer the latter-day tendency, responding to the influence of the French physicians, is to give it in very large doses suspended in water. Thus from 45 to 75 grains are administered three times daily, before meals, suspended in a wineglassful of water. Ewald advises much larger doses administered in the same manner. "Am rationellsten scheint mir die Methode der Französen, welche grosse Mengen, 10–15 Grm. in Wasser gelöst, nehmen lassen."[1] When bismuth is employed its use should be uninterrupted for two or three weeks. It is obvious that in the employment of these enormous doses care should be taken that a pure article of the drug be obtained, and especially that it be free from arsenic. This precaution is not so necessary now as it would have been formerly, as preparations of the drug free from arsenic are, at the present day, much more easy to secure.

For its supposed local effect upon the ulcer nitrate of silver has also been extensively used in the treatment of the disease, and evidence of its advantages is given by good authorities. It is best administered in solution, in doses of about gr. $\frac{1}{3}$ three or four times daily, the treatment being continued for three weeks or longer.

While under either of these forms of treatment, the patients who are not able to undergo the rest-cure are permitted to attend to their daily duties, although great care in the diet is as necessary, although not as easy to carry out, as under the rest-cure plan; the diet should therefore conform as nearly as possible to that already outlined.

The symptoms more particularly requiring treatment in gastric ulcer are pain, vomiting, and hæmatemesis, and all are of frequent occurrence during the course of the disease.

Pain of such severity as to call for special treatment was present

[1] *Klinik, etc.*, Th. 2, S. 431.

in 50 of the Jefferson Hospital cases. In many instances, perhaps the majority, the outline of treatment as already described is sufficient to allay these symptoms. Thus, pain usually succumbs to the influence of the enforced rest, to the administration of a non-irritating and neutralizing diet, or to the use of alkalies, subnitrate of bismuth, or nitrate of silver. Nevertheless, special treatment directed to the relief of pain becomes necessary, not only for the constant pain incident to gastric ulcer, but also for the attacks of gastralgia which in many instances are of such frequent occurrence. Almost as a matter of course we turn first to morphine to alleviate the patient's sufferings, the mode of administration being either by the mouth or subcutaneously. Although this is our main reliance, we must not overlook the advantages to be derived from cannabis indica, belladonna and hyoscyamus; especially from the use of the first-mentioned drug have I obtained the most satisfactory results, when given in combination with morphine or codeine.

Vomiting as a symptom seems to be associated with the gastralgic attacks, so that the treatment instituted for the relief of the latter serves the additional purpose of checking the former. For reasons already given, the most potent factor in bringing about relief from vomiting is rest and the carefully regulated dietary, as well as rectal feeding. The influence of these may be enhanced by allowing the patient to swallow small pieces of ice with a few drops of chloroform. It has been recommended that when vomiting is especially severe and intractable, lavage be performed. Unquestionably marked relief frequently follows this procedure, but it cannot be regarded as entirely free from the danger of causing hæmorrhage or perforation, and I consider myself fortunate in having been forced to its use upon only very rare occasions.

Hæmatemesis in the course of gastric ulcer requires careful management and is a symptom of frequent occurrence. The necessity for all the precautionary measures already advised in the treatment of the disease becomes increased and as much care is required in the treatment of small hæmorrhages as in those that are profuse, as the smaller blood-losses may be premonitory of the larger. It is of prime importance that absolute rest, both general and local, be enjoined. If not already in bed the patient should without delay be placed there, and recourse at once had to rectal feeding. The patient may be allowed to swallow small pieces of ice or small quantities of ice-cold fluids, and ice-cold applications should be placed upon the abdomen. If there be much vomiting or restlessness, morphine should be administered hypodermically. With the view of directly controlling the hæmorrhage, ergot or ergotine may be used subcutaneously. If the hæmorrhage be profuse and show a tendency to recur, Ewald recom-

mends the repeated washing out of the stomach with ice-cold water. Undue retching and straining usually incidental to the introduction of the stomach-tube should be guarded against by cocainizing the pharynx or by the previous injection of morphine. If, notwithstanding our efforts, the patient pass into a condition of collapse, resort must be had to the subcutaneous administration of diffusible stimulants, to stimulating rectal enemata, and the external application of heat. If the patient become exsanguined, transfusion of blood may be resorted to; or, as is at present more generally practised, and with better results, the infusion into the subcutaneous tissues of a pint or more of normal salt solution should be performed. In such cases also, in order that the blood may be retained in the great organs whose function is necessary to sustain life, a ligature may be applied around one, or several, of the extremities.

In perforation treatment has rarely been followed with any degree of success; it should be carried out along the general lines already laid down. The outlook being so unfavorable recourse has lately been had to surgical interference, and several successes have been recorded.

The treatment of ulcer as it occurs in the œsophagus and duodenum is, in general, about the same as when its location is in the stomach. In the case of duodenal ulcer, however, the lesion is more serious and more intractable to treatment than is gastric ulcer; therefore the rest-cure must be rigorously carried out, and the greatest care should be exhibited in the selection and administration of nourishment, in order that the healing of the ulcer may be effected as possible.

PERITONITIS, NON-OPERATIVE AND POST-OPERATIVE, APPENDICITIS, PARATYPHLITIC ABSCESS, AND OBSTRUCTION OF THE BOWELS.

By GEORGE RYERSON FOWLER, M. D.

PERITONITIS.

Inflammation of the peritoneum is exclusively of septic origin. With the evidence before us the existence of idiopathic peritonitis seems extremely doubtful. The disease may be due to direct infection, as, for instance, when the germ comes in contact with the peritoneum, or to indirect infection, in which case the inflammatory affection arises from the presence of certain chemical products, or toxins, which invade the serous membrane through the circulation. In some instances the source of the infection is obscure. The comparatively recent perfection of bacteriological methods of investigation has rendered the discovery of the infecting germ easy; rarely the attempt at culture gives negative results. When the effused products of the inflammation prove to be apparently sterile, the failure to isolate and cultivate the germ may be due to the fact that the latter is inhibited by some unknown cause, or that the particular micro-organisms present is of a variety impossible of cultivation by any of the known methods of culture.

For convenience of study the disease may be divided into—(1) Perforative Peritonitis; (2) Infectious Peritonitis; (3) Symptomatic Peritonitis; (4) Tubercular Peritonitis; (5) Peritonitis due to Undetermined Infections.

Perforative Peritonitis.—In this variety the infection has its origin in the intestinal canal. By far the greater number of cases of peritonitis have their origin in this manner. The lesion of the intestinal canal may involve necrosis of its walls, as in ulcerative lesions, or the germ may pass through the intestinal wall without actual loss of substance of the latter, as when, for instance, this is the subject of disease, or is the seat of circulatory disturbances.

The conditions most frequently present in perforative peritonitis in which the infection takes place from loss of substance of the intes-

tinal wall are acute appendicitis, typhoid ulceration, foreign bodies, penetrating wounds, and gangrenous conditions resulting from intestinal obstruction. In the absence of ulcerative, penetrative, and gangrenous lesions the infection may be due to conditions giving rise to enervating disturbances, such as internal strangulation, strangulated hernia, intussusception, obstructions by twists, mesenteric embolism and thrombus, and in excessive handling of the intestines during operations involving the opening of the abdominal cavity. Blows upon the abdominal surface may likewise give rise to the disease.

In these cases the germ most frequently found is the *bacterium coli communis*. The almost constant presence of this germ may be due not so much to the fact that it is alone the cause of the peritonitis, but because it is the most common and abundant infectious agent in this locality under normal conditions, constituting as it does about 95 per cent. of all the germs found in the intestinal canal; and for the further reason that this micro-organism possesses such rapid powers of reproduction that other microbes are crowded out of existence by its growth, or at all events their identification is rendered impossible.

Infectious Peritonitis.—In this variety the inflammation of the peritoneum is caused by extension of infection from pre-existing septic foci or sources of infection either within the abdominal cavity or adjacent to the peritoneum, such as the rupture of abscesses, or the extension of infectious inflammation from the genital tract. It is the variety present following imperfect asepsis in operative procedures involving exposure and contamination of the peritoneal surfaces.

In infectious peritonitis the common pus-organisms, viz. the streptococcus and staphylococci, are present. The more common sources of infection in this variety are infectious inflammatory lesions of the uterus and Fallopian tubes in the female, suppurative hepatitis, gall-bladder affections, suppurative kidney lesions, abscesses and inflammations of the abdominal wall, and, as before stated, operative infection. In the more severe of these affections the streptococcus is most frequently found, and for the reason that this is the most virulent of the pus-organisms, in the peritonitis due to this cause the inflammatory action is of a high grade, and is almost if not quite as fatal as that due to the colon bacillus. The staphylococci are also frequently found, but usually in conjunction with other organisms.

The fact that in cases where infection occurs following operative attacks upon the uterus and Fallopian tubes the resulting inflammation of the peritoneum is of a most severe and generally fatal character is due to the presence of the streptococcus, which is frequently found to be present. Although some forms of the staphylococci are occasionally found to possess a virulence almost if not quite equal to

that of the streptococcus or of the colon bacillus, as a rule the infectious inflammation following exposure to the former, or more common pus-cocci, is neither so rapid in its development and course nor so fatal in its results as that which follows streptococcus infection.

Erysipelatous infection in other and remoter portions of the body, as for instance in facial erysipelas, depending as it does upon the presence of the streptococcus, occasionally gives rise to a streptococcus infection of the peritoneum. Under these circumstances the infection undoubtedly takes place through the circulation.

Symptomatic Peritonitis.—An acute peritonitis may occur in the course of an acute or chronic disease which itself is dependent upon a specific germ. Of these pneumonia and pleurisy are the most frequent. The pneumococcus is the germ most frequently found under these circumstances. The presence of this micro-organism has been frequently demonstrated in the peritoneal cavity in fatal cases of pneumonia, although it does not seem to have always produced peritonitis. On the other hand abundant and apparently indubitable evidence has been obtained proving that the peritonitis occurring in the course of pneumonia has been due to the presence of the pneumococcus. Cases of peritonitis in which this germ has been obtained in pure culture have been recorded. In the majority of these instances of pneumococcus infection either pneumonia or pleurisy was present.

Tubercular Peritonitis.—This is most commonly secondary and due to extension of infection from the intestines, the genital organs, particularly the reproductive organs in the female, and the mesenteric and retro-peritoneal glands; or it may follow tubercular affections in the pleura and lungs. It may occasionally occur as a primary disease of the peritoneum.

The classification of Aldibert is usually followed. According to this authority the ascitic, the fibrous, and the ulcerative forms are to be distinguished. The first named, as its name implies, is accompanied by a large amount of simple, non-purulent ascitic fluid, in which the intestines float about freely, owing to the absence of strong adhesions. The process is usually a subacute or chronic one. It occurs, although rarely, as an acute miliary tuberculosis of the whole peritoneum. In the fibrous form ascites may be present, but it is not abundant. In cases unaccompanied by ascitic fluid, the so-called "dry variety," neither ascites nor adhesions are present. Large tubercles are found here and there upon the peritoneal surfaces. In still another variety of the fibrous form of tubercular peritonitis, the coils of intestine are matted together in a mass by adhesions. The fibrous form of the disease has been regarded as a stage in the process of recovery. In the ulcerative form the tubercular foci break down and tissue-necrosis is the prominent feature. In the first stage there

is no suppuration, the process being essentially a dry one. Later on suppurative changes take place, these being either isolated or encysted, in which case the different stages of the necrosis may be present in different portions of the peritoneum, or the suppurative process may be general.

Undetermined Infections.—Peritonitis may occur in the course of syphilis, rheumatism, and gonorrhœa. Here the inflammation depends upon some indefinite infection. In many of these cases the presence of a definite infecting germ has not been made out, although it may be suspected. In this form of the disease may also be included the peritonitis of the new-born, although in this class of cases it is not always possible to exclude infection arising during the separation of the umbilical cord.

In spite of the now generally received opinion that peritonitis is always of septic origin, the contention occasionally arises that a simple, general, and non-infecting peritonitis is possible, and that it does occur. Cases in which the abdomen has been opened with a successful result in the course of general sero-purulent and purulent peritonitis, and in which attempts to obtain cultures have failed, have been reported. Cases of so-called "chemical peritonitis," in which all the signs of peritonitis were present and demonstrable at the operation, but with absolutely sterile cultures, in strangulated hernia, are likewise reported. Admitting the reliability of the technique employed in the bacteriological investigation, it may still be stated that there are probably micro-organisms possessing sufficient virulence to produce the disease for which proper culture-media have not been discovered.

Symptoms and Course of Peritonitis.

The onset of peritonitis depends largely upon the virulence of the infecting agent and the rapidity of the invasion of the peritoneum. In perforative peritonitis, as well as in infectious peritonitis from the rupture of a large abscess into the cavity of the peritoneum, the rapid dissemination of the infectious material over the large serous surface gives rise to proportional symptoms of a shock, rapidly followed by general collapse. Inflammations which extend slowly from a small septic focus, on the other hand, are not attended by shock. Pain is an early symptom, which also varies, both in its severity and persistence, with the virulence of the infection and the rapidity of its extravasation. It may be absent altogether. Both pain and tenderness may be at first localized, subsequently becoming general. Nausea and vomiting are almost invariably present and follow rapidly upon the onset of the disease, the contents of the stomach being soon followed by bile, and finally, in fatal cases, by material from the small

intestine, which is ejected without apparent effort by regurgitation. Hæmorrhage from the mucous membrane may occur, in which case the vomitus is of a dark-brown color.

Symptoms of septic absorption set in early in unfavorable cases, as evidenced by a rapid rise in the pulse-rate from 120 to 160; exceptionally it may be less than 100 to the minute. The temperature observations may show this to be excessively high, unaffected, or even below the normal. The intellect generally remains unimpaired to the end. The slow development of the disease is accompanied by only moderate disturbances of pulse and temperature. Chill, as a rule, is absent.

Paralysis of peristalsis occurs early, as a rule, in extensive infection, and symptoms of acute obstruction result, with, save in exceptional cases, absence of the gurgling sounds of peristalsis. An excessive distention follows. The skin of the abdominal wall becomes tense, livid, and shining, and resonance is everywhere tympanitic. In cases of mild infection distention may be the first symptom observed. Rigidity of the abdominal wall, localized at first, afterward becoming marked and general with the spread of the inflammation, is an important symptom early in the case; it may disappear with increasing distention. Serous exudation, which finally becomes purulent if the patient survive, always occurs. In tubercular peritonitis the only early symptoms in many cases are those which indicate grave general nutritive disturbances. There are digestive disturbances, progressive emaciation, and some swelling of the abdomen, which, later on, may become extreme. In some instances there may be no pain, while in others this becomes a prominent symptom.

Diagnosis.—In typical cases the diagnosis is comparatively easy. It not unfrequently occurs, however, that many of the cardinal symptoms are absent, and in some instances these may be altogether wanting, and the diagnosis is only made post-mortem. Vomiting, early, persistent, and intractable, is diagnostic, particularly in general infection. The value of pain in diagnosis is frequently overrated and may not be sufficiently prominent to cause complaint. Vomiting, pain, and distention, following rapidly upon each other, form a striking group of symptoms, and if to these be added a brownish-colored regurgitation, the constitutional effects of sepsis, and the occurrence of obstinate constipation, the diagnosis is assured in the great majority of cases. It is nevertheless true that the vomiting may be due to other causes, the pain to efforts at peristalsis, the distention transitory and from gas, and the inability to move the bowels or effect the expulsion of flatus to the administration of opium.

The great variations observed in different cases in the beginning of an attack of peritonitis is due to the variety of micro-organisms upon

which the infection depends—these differing, in their turn, in their toxæmic and other properties—as well as to the susceptibility of the individual. Later on, however, with the advance of the disease, the symptoms become highly characteristic.

In the differential diagnosis it is of the utmost importance to distinguish between peritonitis and acute intestinal obstruction. Pain, distention, vomiting, and constipation may be present in both conditions. The vomiting, however, may be absent if the obstruction is in the large intestine. The occurrence of obstruction above the ileocæcal valve may permit of one or two movements of the bowels, and in rare cases fæcal evacuations may be obtained throughout the entire course of acute peritonitis. As a rule, however, constipation is complete in both conditions. The character of the pain is important. In acute obstruction it occurs as a severe and paroxysmal symptom, while in peritonitis it is both severe and persistent. Its primary location, in obstruction, is frequently referred to the seat of the lesion, while in peritonitis it is most often observed in the epigastrium or about the umbilicus, and becomes general later. In both conditions the pulse, as a rule, becomes accelerated, although in obstruction it may be slower than normal. In peritonitis this rarely, if ever, occurs. The temperature is not elevated in the commencement of intestinal obstruction; it may rise comparatively early in peritonitis. The onset of the attack in obstruction is generally sudden, while peritonitis, particularly in the less fulminating cases, occurs more gradually.

The differential diagnosis is particularly as between perforative peritonitis and acute obstruction, as well as in cases in which the two conditions are combined. The latter is especially striking for the reason that all cases of obstruction tend to eventuate in peritonitis, and with the early masking of the symptoms by opium nothing short of opening the abdomen, which should be done in all doubtful cases, will clear up the diagnosis. Finally, the previous history of the patient, the occurrence of former attacks of an intra-abdominal inflammatory character to account for intestinal obstruction, as well as the possibilities of appendicitis, ambulatory typhoid, suppurative diseases of the adnexa in females, and purulent collections or infectious conditions in neighboring organs, as well as statements regarding the reception of injuries, are to be taken into account.

In tubercular peritonitis the cases unaccompanied by pain, and before the occurrence of ascites and pronounced abdominal swelling, should be carefully differentiated from typhoid fever. Cases in which the disease attacks the mesentery, the lymphatic glandular structures, and the omentum, without ascites, simulate tumors of the kidney, peritoneal cancer, appendicular abscesses, intestinal obstruction, adnexitis, and even neoplasms in the abdominal wall. In the ascitic

form ovarian, mesenteric, and hepatic cysts are to be excluded. The diagnosis is most frequently made by exploratory incision. In typhoid perforation the accident may occur at any time in the course of the disease. It is most frequently observed in males, and rarely in children. Save for the coexistence of the typhoid fever, peritonitis from this cause does not differ from that resulting from other intestinal perforations.

Prognosis.—The occurrence of early shock and collapse stamp the case as almost necessarily fatal from the commencement. Severe and persistent pain mark the occurrence of rapid and extensive infection of the peritoneum. Dark-brown or black, coffee-colored vomited matter is almost invariably followed by death. Even vomiting without effort or simple regurgitation is to be viewed as a bad omen. Death may take place from early and rapid septic absorption. A rapid rise of the pulse to 120, 140, and 160 is significant of an early fatal termination. High temperature is always an unfavorable sign, although the reverse does not hold true. Very slight hope of recovery can be entertained when the paralysis of peristalsis is complete. Lividity of the skin and also a general "leakage" from the cutaneous surface, are most ominous signs, indicative of a profound sepsis. The character of the pulse, however, indicates the patient's condition with far greater certainty than any other one symptom. If it gradually and persistently increases in frequency and assumes either a gaseous or thready feel, an unfavorable prognosis must be given.

On the other hand, if the tenderness and rigidity remain localized, the prognosis is more favorable. The fact that bowel movements can be obtained suggests that the infection is less virulent in character, and hence the outlook better. In favorable cases the vomiting ceases, the pulse-rate becomes slower, and the temperature lessens, until convalescence is established.

Tubercular peritonitis gives the same comparatively unfavorable prognosis as tubercular lesions elsewhere, when treated medically. The outlook is better in cases submitted to surgical operation, about four-fifths recovering. In the non-ascitic form the disease has reached a stage in which it is progressing toward spontaneous cure.

Treatment.

In the medical treatment of peritonitis the choice of two methods is open to the practitioner. Before the present views of its etiology were entertained it was considered of the greatest importance to restrain active peristalsis, inasmuch as this latter was believed to favor the spread of the inflammation. In addition to this the pain was relieved and, in some instances, the vomiting kept under control. At the present time the opponents of the opium method of treatment

claim, and with reason, that opium as formerly employed increases the distention, and prevents the absorption of exudates and the elimination of ptomaïnes.

With our present knowledge of the septic origin of peritonitis, and the recognition of the fact that the chief danger in the disease consists in the absorption of the toxic products of the septic processes rather than in the spread of the inflammation, measures to provide for an elimination of these products through the intestinal canal form the most rational therapeutic indication. In providing for free catharsis distention is likewise relieved and absorption of peritoneal exudates favored. The method of intestinal drainage, as it is called, has been the means of saving many lives when instituted early, and is now considered the most rational and efficient of the medical means at our command, particularly when employed early in the disease, before vomiting has become persistent and intractable. Under these circumstances the distention is relieved and the peritoneum "dried out," as it were, by the endosmotic processes which follow free catharsis, and the serous effusion, which forms a favorable culture-medium for the propagation of germ life, removed. Later on in the case, when general peritonitis is fully developed, it is doubtful if cathartics exercise a favorable influence upon the course of the disease. Indeed, it is generally useless to attempt to procure free evacuations by their use, since they frequently fail to act, and only increase the nausea and vomiting and the discomfort of the patient. In the event of the existence of a perforation of the intestinal wall a positive contra-indication to their use exists, for the reason that they increase the extravasation of liquid fæcal matter into the peritoneal cavity.

Thus it will be seen that both of these methods of treatment find a place in the resources of the practitioner. That by catharsis should be first instituted, with the hope of cutting short the disease in its incipiency by promptly relieving the distention and averting paralysis of peristalsis and draining the peritoneal cavity of whatever serous exudate may be present, and thus getting rid of what has been shown by laboratory experiments and clinical experience to be a source of danger in the presence of micro-organisms, namely, a favorable culture-medium for the growth of the germs.

When the vomiting has become uncontrollable and the distention extreme it is useless to attempt to influence the onward progress of the disease by these means. The patient will reject the cathartic agent almost immediately, and even if it should be retained, the muscular apparatus of the intestinal canal, no longer under the control of its nerve-supply, will refuse to respond in a normal manner.

The employment of opium now finds its legitimate place in the case. The object sought is to carry the patient along with the view

of protecting his nervous system from the effects of the intense restlessness which is generally present, and incidentally to relieve the pain and control the vomiting. This is accomplished by opium better than by any other drug. As long as there is any hope for the patient the remedy is to be given in small doses frequently repeated, until vomiting is under control or at all events markedly abated. Only too often, however, the general condition of the patient stamps the case as so indubitably hopeless, and the suffering becomes so extreme, that the practitioner seeks refuge in larger doses of opium with the sole view of euthanasia.

The class of cathartics selected, when this method of treatment is applicable to the case in hand, is that known as salines. The one most generally acceptable and efficacious is the sulphate of magnesium, or Epsom salts. This should be given in half-ounce doses, either as a saturated solution, or, what I generally prefer, in just sufficient Vichy to effect the solution of the salt. This may be followed later on, if free catharsis is not obtained, by drachm doses given hourly until either a decided response to its action results, or it becomes evident by the increase in the nausea and vomiting that it is useless longer to expect it to act. Under circumstances of general infection, when only constant regurgitation of the contents of the small intestine follow its use, it should be abandoned and calomel substituted in $\frac{1}{5}$-grain doses repeated hourly. This will sometimes produce free catharsis without vomiting, and occasionally exercises a soothing effect upon the stomach itself. The action of these may be supplemented by enemata.

When the indications are such as to impel the attendant to resort to the opium treatment, the hypodermic use of morphine should be employed whenever practicable: $\frac{1}{12}$-grain doses given at intervals of from two to three hours act as a stimulant to the nervous system and are sometimes followed by a cessation or diminution of the vomiting, and occasionally by an improvement in the general symptoms.

There are certain conditions of peritoneal irritation following abdominal section in which opium becomes of the greatest service. The pain which this condition induces robs the patient of sleep and may bring about symptoms of exhaustion. Hence sufficiently large doses of the drug should be given to allay pain and secure comfortable sleep, as well as bring the vomiting resulting from the use of ether, which is sometimes a very distressing symptom, under control. One or two $\frac{1}{6}$-grain doses will usually suffice to fulfil these indications.

In the treatment of post-operative peritonitis much judgment may be displayed by the alert practitioner. With the first evidence of infection, or the commencement of distention, and before the vomiting becomes a prominent symptom, a dose of Epsom salts should be given

and efforts made to facilitate the action of the latter, as well as to relieve the threatened tympanites, by the use of enemata.

The employment of surgical measures of relief sometimes becomes a question of grave importance. It is extremely difficult to state the indications for operative interference, even if the surgeon see the case early, which, as a rule, he does not. To institute an abdominal section early is to run the risk of encountering a simple functional disturbance, and hence to have operated unnecessarily. On the other hand, with the indubitable evidences of an acute general peritonitis before him the surgeon is frequently confronted with the probability, if he interferes, of taking away the patient's only, although slight, chance of recovery. The grave prognosis that must always be stated, whatever course is pursued, will always prevent the conscientious surgeon from urging operation, and when the responsibility of deciding is thrust upon him he will be likely to follow the results of his own experience in this class of cases, without the aid of the opinion of others. If this experience has been large he will recall how many times he has operated in similar cases, and perhaps has never succeeded in saving life; on the contrary, he will feel that death has been only hastened. Thus, with very little encouragement to undertake the task of opening the abdomen, he will generally decide the question in the negative in the great majority of cases of peritonitis as they pass into his hands from the medical practitioner.

When, however, a recognized focus of infection is present as the starting-point of a peritonitis that has not yet become general, as in cases of appendicitis, suppurative adenitis, suppurative cholecystitis, gunshot injuries and penetrating stab-wounds, as well as traumatisms infected from the direction of the urinary tract, and even in typhoid and duodenal ulcerative perforations and in ruptured abscesses, there can be no question as to his duty, if called before general infection of the peritoneum is at hand: he should open the abdomen promptly, and treat the conditions found upon surgical principles. But unfortunately, even when the spreading infection is due to these causes, valuable time has been lost by inefficient medical treatment, and surgical aid is invoked only when the time has passed for its successful employment.

Besides the causative lesions above mentioned, there are others which demand surgical treatment, in addition to the benefits to be derived from opening the abdomen and draining the peritoneal cavity. These include intussusception, twists, internal strangulations from bands, and mesenteric thrombosis and embolisms. In all of these there is usually a period of time which elapses between the commencement of the symptoms and the supervention of a general peritonitis, as well as the presence of characteristic symptoms, that

will permit of successful surgical interference. Although a strict anatomical diagnosis is not always possible, nor yet the differentiation between a commencing peritoneal infection and a mechanical lesion, still the argument in favor of immediate operation is cogent and the indications are clear. In an acute abdominal condition in which these questions alone remain to be settled, exploratory incision is justified, and frequently demanded, if the case be seen sufficiently early to warrant the undertaking.

The general measures of treatment applicable to tubercular lesions elsewhere should be taken advantage of in tubercular peritonitis. A nutritious diet, tonics, and change of air constitute the palliative treatment. Aspiration of the ascitic fluid should give place to free incision and drainage, preferably by gauze and wicking, which is dispensed with in a few days. In the simple ascitic form this should be done early. When the disease exists in an acute miliary form operative interference is inadvisable. There is no advantage to be gained by flushing the peritoneal cavity with water or chemical solutions. In this form (the ascitic) relapses occur in about 10 per cent. of the cases operated upon. In the non-ascitic form exploratory incision may reveal localized collections the evacuation of which may hasten the cure. In cases in which numerous pus-collections are present no permanent improvement is likely to follow the breaking down of these, since probably many are not within reach, and great danger is invited by the manipulations necessary to effect this. Isolated instances of improvement following removal of local and defined tubercular mesenteric and retro-peritoneal lymph-glands are reported (Richardson). Intestinal obstruction dependent upon tubercular infiltration of the bowel-wall should receive the same treatment as that due to cancer. The mortality following incision in the ascitic form of the disease is trifling. The rationale of the method of cure is not known.

In typhoid perforation with general extravasation surgical aid should be invoked early. Perforations from one coil of intestine to another, and even slight extravasations, probably pass unrecognized frequently. With abundant and rapid fæcal extravasation, in the absence of early and efficient operative interference, death occurs unexceptionally.

Three facts should be borne in mind in connection with the operative treatment of peritonitis occurring in the course of typhoid fever: 1. The peritonitis may be due to causes other than typhoid perforation, such as acute intestinal obstruction, softened infarcts of the spleen, softened glands, abscesses of the bladder-wall, abscesses of gall-bladder of ovarian and hepatic origin, rupture of the spleen, and to extension of inflammations from the adnexa and endometrium (Fitz). 2. More than one perforation may be present in typhoid ulceration.

3. Indubitable evidences of peritonitis may be found with no discoverable local lesion present to account for the inflammation.

APPENDICITIS.

Inflammation of the vermiform appendix, until recently clinically associated with typhlitis, perityphlitis, and paratyphlitic abscess, is now known to be a distinct affection. The large majority of cases formerly placed to the credit of the above-named comparatively minor affections are now believed to have been instances of appendical lesions.

At least half of the cases of appendicitis occur in persons under twenty-five years of age; 80 per cent. occur in males, as against 20 per cent. in females. Its occurrence as the result of traumatism, if we except the presence of fæcal matter which may enter the appendix in a semi-fluid state, afterward becoming hardened into coproliths, and produce minute excoriations and abrasions, thus leading to infection of its walls, is rare. The supposed seeds of certain fruits which have been found in the appendix were probably, in the large majority of cases, masses of fæcal matter which had become moulded into shapes resembling lemon-seeds, cherry-pits, etc., in the lumen of the organ.

Occasionally, however, this same fæcal matter has incorporated in it strawberry or raspberry seeds which give a roughened exterior to the mass when drying, and in this manner the latter may assume the rôle of a foreign body. In addition to this a genuine enterolith, made up of calcareous matter and having its origin in the intestine or in the appendix itself may be found in the cavity of the organ and be viewed as bearing an etiological relation to the disease as occurring in the individual case. But one such instance has fallen under my observation.

In the same category may be included cases in which a gall-stone has passed safely through the ductus communis choledochus and along almost the entire length of the intestinal canal, only to be finally arrested at the appendiculo-cæcal orifice, and perhaps find its way into the initial portion of the appendix, owing to a more or less funnel-shaped form of the organ the result of a persistence of the fœtal type of the latter.

In seeking for a plausible reason for the ease with which inflammatory conditions may be set up in the appendix vermiformis, due consideration is to be given to the fact that this organ belongs to the class of vestigial organs, or those whose function has passed away, and the vitality of which have become thereby greatly lessened in the course of those changes in structure which precede their final

disappearance altogether. The organ in question is made up largely of lymphoid tissue, the chief characteristic of which is the absence of that high degree of vital resistance which is present in the tissues of organs with well-marked and important functions. Bearing this fact in mind it is not difficult to comprehend how a foreign body, or even dried fæcal matter, may easily produce slight abrasions of the surface of the mucous membrane lining the organ and thus initiate the series of nutritive changes which may give rise to infection, followed by either gangrene and perforation, or suppuration within peritoneal adhesions, and appendicular abscess.

In the majority of cases, therefore, no foreign body is found, if this term be limited to those bodies which are foreign in the strictest meaning of the term. Fæcal matter cannot be considered as belonging to this class, for the reason that it probably finds its way into the appendix and is forced out again by the contraction of its muscular tissues. It is sometimes found to be present when the appendix is removed in a healthy condition in the course of abdominal section for conditions not connected with this organ, and during post-mortem examinations. On the other hand, in at least 50 per cent. of cases of appendicitis the appendix is found to be entirely free from any suspicion of fæcal matter. Further, the intensity of the inflammation bears no relation to the presence or absence of fæcal matter, although it is probably true that perforation of the appendix and direct infection of neighboring structures takes place rather earlier in cases in which these fæcal masses are found. The ulcerative process which precedes the final escape of the contents of the appendix in cases of perforative appendicitis is probably due primarily to direct pressure from the desiccated fæcal mass, this being increased by the expulsive efforts on the part of the organ to rid itself of the irritating material.

So far, then, as causes of appendicitis operating primarily from within are concerned, these may be considered to be (1) foreign bodies, which although of comparative rare occurrence, are nevertheless to be considered as etiological factors in the production of the disease; and (2) fæcal matter the watery constituents of which have become absorbed, thus converting a soft, semi-fluid or pultaceous mass into what becomes to all intents and purposes a foreign body.

In addition to these, due consideration must be given to infectious agents which act from within the tube and which find their way into the latter from the intestinal canal in connection with the contents of the latter. These, however, act secondarily, since the mucous membrane of the appendix, like that of the intestinal canal itself, is capable of resisting irritative effects resulting from the presence of micro-organisms under normal conditions. Nutritive disturbances, however, from whatever cause, are capable of initiating such changes

in the mucosa as to be rapidly followed by infection of the latter as well as the connective-tissue layer immediately underlying the mucous membrane. The course of the inflammatory process which follows will depend upon the virulence of the infectious agents on the one hand, and the extent of the lessened vital resistance of the organ itself upon the other.

Attention has already been called to the fact that the organ possesses but slight inherent vital resistance as compared with organs endowed with a definite function. With this characteristic handicapping its struggle for existence to start with, it is not to be wondered at that the slightest abrasion of its mucous membrane should become the starting-point for rapidly destructive processes which may place the patient beyond human aid in a few hours.

Of no less importance are those causes which, acting from the peritoneal side of the organ, serve as a starting-point for the disease. In the great majority of cases of appendicitis coming under observation it will be found that the organ possesses a true mesentery, and hence, although covered by a peritoneal investment, is just as much an intra-peritoneal organ as the other abdominal viscera. Its mesenteric attachments, however, are such as to permit more or less free movements of the organ within the peritoneal cavity. The effect of this is to favor changes in position of the appendix. Further, certain anatomical peculiarities of the meso-appendix exist which permit of changes in shape as well as position of the organ. These consist of irregularities as regards the length of different portions of the two serous layers which make up the mesenteric structure. As a result of these irregularities the organ may present an undulating outline rather than a straight hollow tube, or a coiled or corkscrew-shaped appearance, or it may be found to be actually twisted upon itself, the mesentery being attached to the organ at several points of the circumference of the latter as if following a coarse-pitched screw instead of in a straight line. Changes in both position and shape of the appendix may result in complete angulation at any point between its base and its tip. If these changes occur to an extent sufficient to interfere with its blood-supply, in its already and natural devitalized state, necrotic changes occur rapidly. If these necrotic changes take place upon the free surface of the mucosa, infectious processes are added to complete the work of destruction. Further, with neither angulations nor twists, position alone may act primarily to bring about an attack of the disease. This is true particularly when the organ, pointing directly upward, lies between the outer side of the colon and the lateral abdominal wall. Thus located it is subjected to pressure, and the latter, in the case of an overloaded large intestine, may be sufficient to interfere with its blood-supply and give rise to conditions leading

to the development of the disease precisely as in the case of angulation, namely, the occurrence of necrotic areas, infection, and inflammatory changes of a rapidly destructive character. Finally, the occurrence of neural as well as vascular disturbances (endarteritis obliterans, Van Cott) is to be mentioned.

The infecting micro-organism most frequently found is the *bacillus coli communis*. This micro-organism exists constantly in the lumen of the appendix and also in the exudate in the peritonitis accompanying inflammation of that organ. Other bacteria, such as the *bacillus pyogenes fœtidus*, the *diplococcus lanceolatus*, and the common cocci of suppuration, are occasionally found.

Symptoms and Course of Appendicitis.

In the great majority of cases an attack of appendicitis is characterized at its onset by the occurrence of acute abdominal pain, such as is usually experienced in an attack of ordinary intestinal colic. The similarity of the onset of the latter affection and appendicitis should always place the practitioner on his guard, and the occurrence of sharp colicky pains serve to direct his attention to the vermiform appendix. The additional fact that the pain is first referred, in a large proportion of cases, to the epigastric or peri-umbilical region, and further, the occurrence of vomiting early in the case and the frequent absence of fever at this stage, serve in even greater degree to mislead the medical attendant.

With the advance of the disease pain is referred to the right iliac region, and tenderness is found to exist at this point. This tenderness is quite localized at first, and is found most frequently best marked upon the outer edge of the rectus muscle, and slightly above the level of the transverse line extending from the anterior superior spinous process of one to that of the opposite side. It may, however, be found below this line and nearer to Poupart's ligament. In cases of congenital abnormality of location of the cæcum the point of maximum tenderness will be elsewhere. Marked tenderness in the loin may be found in cases in which the retro-peritoneal connective tissue is involved.

The vomiting is not frequently persistent during the initial stage of the disease, and usually ceases with the evacuation of the stomach contents, unless the occurrence of septic general peritonits causes its return. Nausea alone, in some instances, is complained of.

Rigidity of the right rectus muscle is a marked feature in the majority of cases. This muscular rigidity becomes general in cases of extensive septic peritonitis. The right side of the abdomen may have a bulging appearance due to distention of coils of intestine in the immediate neighborhood of the inflamed appendix.

The temperature and pulse vary in different cases, although they do not by any means bear a constant relation to the gravity of the attack. There may be an almost normal temperature and pulse-rate, and yet ulceration, perforation, and septic peritonitis impending.

Fever may make its appearance as early as the second day, but as a rule it is delayed beyond the third. The mass of adhesions constituting the lesion may become the site of a suppurative process from perforation of the appendix into the adhesions, or infection of these may occur from bacterial migration. This constitutes the so-called appendicular abscess. Sero-purulent collections may occur in addition, beyond the immediate area of the appendix, and even at remote points, from infection through the lymph-channels.

In addition to the clinical picture presented by typical cases, there may occur cases of a subacute character. The practitioner should be on the watch for the sudden onset of violent symptoms in this class. Cases apparently of a mild type, and supposed to be only of a catarrhal character, may terminate suddenly and fatally from perforative peritonitis, and cases with alarming symptoms may go on to a favorable termination.

With apparent recovery without removal of the appendix the patient may suffer from relapses during the persistence of what is really a chronic relapsing form of the disease. Or, complete recovery may take place, but the patient be subjected to recurrences of the affection.

Diagnosis.—The cardinal symptom of sudden onset, acute abdominal pain referred to the general region of the abdomen rather than to the site of the vermiform appendix, at which place it may appear later on, vomiting, tenderness in the right iliac fossa, and comparative rigidity of the lower portion of the right rectus muscle are the distinguishing features of typical cases. The disease must be carefully differentiated from nephritic colic, cholecystitis, inflammatory diseases of the adnexa in the female, and some of the forms of intestinal obstruction. There is greater danger of overlooking appendicitis than of diagnosing one of these as appendicitis. Stercoral typhlitis is a rare affection compared with appendicitis, and, besides, it lacks the features of acute attack without preceding symptoms. In paratyphlitic abscess operative measures will be required, and it may be impossible to make a diagnosis beforehand. In perforative typhlitis, either from ulceration or foreign body, operative interference will be just as urgently demanded as in appendicitis.

Treatment.

While the medical attendant is generally first summoned to a patient suffering from appendicitis, the case should be viewed as one

most likely to become surgical in character at short notice. Hence the responsibility of the treatment should be shared both by the physician and the surgeon. If the symptoms denote a mild type of the disease the careful use of salines may be permitted in the very commencement. The use of opium is to be avoided if possible prior to making the diagnosis, and even thereafter as much as possible, for the reason that the course of the disease may be thereby masked, the patient seemingly improving under its use while symptoms of the gravest character are simply prevented from announcing, by their presence, the real condition. The patient may present a general appearance of well-being during which a sudden increase of pain, followed by distention of the abdomen, accompanied or followed by a rapid pulse and some rise of temperature, announce the occurrence of septic peritonitis. It should also be borne in mind that an exceptionally virulent infection may produce septic peritonitis with neither primary perforation of the appendix into the peritoneal cavity nor rupture of an abscess-cavity. Under these circumstances delay in operative interference will result in disaster, and even operation may fail to save the patient.

The indications for operative interference during an attack of appendicitis, save under the exceptional circumstances to be dwelt upon later on may be summed up as follows: As soon as a positive diagnosis of progressive appendicitis is assured, the abdomen should be opened and the appendix removed. If opium has been injudiciously administered and doubt thereby cast upon the progressive character of the case in hand, it is better to err upon the side of safety and remove the appendix. The conditions present are usually beyond the reach of remedial remedies or the power of nature to control. On the other hand, with moderately skilful surgical aid at hand and strict attention to aseptic details, both preliminary to and in the course of the operation, the latter entails less risk to life than that which is involved in even a mild attack of appendicitis which remains stationary at the end of twenty-four hours, with all the possibilities of lymphangitis, infection of the peritoneal cavity, retained muco-pus within the tube and rupture of the latter into an unprotected peritoneal cavity, or ulceration and perforation either from the presence of so-called coproliths or inspissated fæcal matter imprisoned within the cavity of the appendix, or from gangrenous conditions alone.

Many difficulties are encountered in attempting to formulate a definite rule for action in the operative treatment of appendicitis. While it is true that to operate too early may be to operate unnecessarily, it is equally true that this is preferable to operating too late and hence unsuccessfully. The fact that operative procedures are gen-

erally quite safely performed where a distinctly outlined tumor is present, providing the wall of the encapsulated abscess is not disturbed in the manipulation, has led some authorities to adopt this period of the disease as the stage of election. Under these circumstances, however, the surgeon will not be able to perform a complete operation, but must content himself with simply opening and emptying an abscess-cavity, the appendix itself being permitted to remain to give rise to subsequent attacks, one of which may prove fatal before the formation of an abscess. On the other hand, it is advocated to operate as soon as the diagnosis of appendicitis has been made, whatever its grade of severity. Between these extreme views held by those who favor operative measures a middle course is usually available. A case demanding operation within twenty-four hours from the beginning of the attack is exceptional. On the other hand, a case which is not well on the road to recovery at the end of the first day of the disease may be deemed progressive in character and should be made the subject of operative interference. This, however, must not be regarded as a hard and fast rule, and the surgeon should not limit himself to the period mentioned. Cases occasionally occur which present unusually severe symptoms within twenty-four hours, such as persistent high temperature and a succession of rigors, conjoined with exquisite tenderness in the right iliac fossa and the characteristic facial expression of a grave intra-peritoneal condition. Here the surgeon should not hesitate to give the patient the benefit of an early and radical operation.[1]

Where the aid of the surgeon is not sought until the third, fourth, or fifth day of the attack, the question as to whether or not the operative procedure may be contraindicated by the impossibility of removing the appendix without breaking down the adhesions which serve as a barrier between the original focus of infection and the general cavity of the peritoneum is frequently encountered by those engaged in this class of work. As Richardson of Boston has very tersely stated it, the surgeon may be confronted by conditions which stamp the case as one too late for the early operation, and too early for a safe late operation. This question must be decided upon the basis of the experience of the operator, as well as the means at hand in the shape of skilled assistance and other requisites to meet all emergencies as they arise. With these conditions fulfilled the operation at this the period of localized peritonitis—even to the extent of removing the appendix—is

[1] The fact should not be lost sight of that the causes which lead to the development of the symptoms may be in operation for one or more days before the latter manifest themselves; the diseased process in its early stages (such for instance as the pathological changes in the vessels of the meso-appendix known as endarteritis obliterans) being well under way before the characteristic colicky cramping pains and vomiting occur.

both safe and advisable. In their absence the operator would be justified in permitting further time to elapse, in the hope that the adhesive barriers which have been thrown out will become still stronger, and hence the dangers of peritoneal infection lessened. This, however, involves the absolute abandoning of all hope of removing the appendix, since in the attempt to accomplish this it will be almost impossible to avoid breaking down some of the adhesions. If, however, any portion of the appendix presents itself in the appendicular abscess-cavity it will be safe to ligate and excise this. Whether all or a portion of the organ is to be permitted to remain, however, is a question that must be decided in the patient's own immediate interest, the basis of such decision, as before stated, being the operator's experience and the facilities at hand for a safe carrying out of the complete operative procedure.

With the complete development of peritonitis operative measures may still be instituted. The chances of recovery, under these circumstances are relatively small. With infection of the effused serum following peritonitis the case offers only just sufficiently encouraging results to warrant the surgeon in giving the patient the benefit of a late interference. With the occurrence of general suppurative peritonitis the case is almost necessarily hopeless ; with the lapse of time following general peritonitis the chances of recovery progressively diminish. In cases in which the septic peritonitis is due to rupture of one or more of the minute embolic abscesses which sometimes form in the wall of the appendix in the course of a suppurative inflammation of the walls of the organ, operation may still be undertaken provided the serous effusion be not large and the symptoms of septicæmia be absent. On the other hand, if the entire contents of an abscess-cavity, or of an intra-peritoneal encysted effusion has escaped into the cavity of the peritoneum from rupture of adhesion, the surgeon will be confronted by an almost hopeless condition of affairs. In such cases it is advised by some to flush out the peritoneal cavity with sterilized water, or with an artificial plasma in order to rid the patient of the source of general infection which almost necessarily comes on under such circumstances. The condition of the patient is usually such as to leave the operator the only choice of simply cleansing the portion of the peritoneal cavity readily within reach. Sterilized water alone is irritating to the peritoneum, and the artificial plasmas recommended cannot all be recovered after filling the peritoneal cavity with the same. That which remains behind forms an excellent culture-medium for further propagation of the infectious agents which must almost necessarily be left behind.

Dawbarn's experiments show conclusively the impossibility of removing all of the infected serum or the irrigating fluid introduced.

This observer filled the peritoneal cavity of the cadaver with milk. He then flushed the cavity repeatedly, using every endeavor to work the flushing fluid thoroughly into every portion. After removing as much of the fluid as possible it was still found, upon examination, that considerable portions of the milky fluid remained in remote portions of the cavity.

In those instances in which a purulent collection has taken place in the post-peritoneal connective tissue, being bounded anteriorly by the transversalis fascia and posteriorly by the iliac fascia, the abscess-cavity may be reached by a horizontal or an oblique incision placed to the outer side of the epigastric artery. By carrying the incision through the skin, superficial fascia, aponeurosis of the external oblique, the transversalis muscle, and transversalis fascia the focus of suppuration can be reached without incising the peritoneum.

In cases in which the suppurative process points posteriorly (lumbar phlegmon) the incision may be made in the lumbar region, the area of suppuration being freely incised and access afforded to the deepest point. It will rarely be necessary or desirable to drain localized sero-purulent collections through the rectum or vagina. The difficulties experienced when either of these routes is chosen introduce dangers into the case which far outweigh those following the adoption of the intra-peritoneal route in competent surgical hands. I can readily understand, however, the choice of one or the other of these by one unaccustomed to abdominal operations and hence unfamiliar with the technique necessary to prevent infection of the general peritoneal cavity. Rarely, however, will such an operation be the one of choice at the hands of a skilled abdominal surgeon, and then only under circumstances where a fluctuating tumor can be plainly made out from the direction of one of the cavities mentioned, and in which it is sufficiently certain that the intervening structures are so matted together by the inflammatory process as to afford a reasonable guarantee against connective-tissue extravasation and infection by means of the contents of the abscess. In other words, unless the suppurative focus or abscess is clearly pointing in one or another of the directions mentioned, drainage by either of these routes is difficult to accomplish, unsatisfactory in its results, and hence not to be chosen.

The after-treatment of cases of appendicitis which have been subjected to operative interference is sometimes, from force of circumstances, left in the hands of the medical attendant. In simple uncomplicated cases the wound requires no attention for the first five or six days. After that the dressings are removed and replaced by fresh ones. In order to avoid the presence of serious effusion in the peritoneal cavity, which even a small amount of handling of the

abdominal contents induces, the patient is deprived of fluids for the first twelve to eighteen hours, the lips, however, being kept constantly moistened by a piece of gauze dipped in water. The effect of this deprivation is to compel the peritoneal absorbents to take up whatever serum is present in the peritoneal cavity, thereby preventing it from becoming a culture-medium for the propagation of whatever micro-organisms may have found their way therein either before or during the operation. This is the surest method of preventing septic peritonitis with which I am familiar.

Vomiting may take place to an extent requiring the use of special remedies for its relief. If this occurs soon after the operation lavage should be practised with the view of getting rid of the mucus charged with ether which has passed into the stomach during the operation. Later on, the symptom is to be treated with $\frac{1}{4}$-grain doses of muriate of cocaine every one or two hours, counter-irritation to the epigastrium (thermo-cautery), or an occasional teaspoonful of plain hot strong coffee.

Abdominal distention is always a symptom which arouses anxiety. When this is accompanied with epigastric distress it may be relieved by lavage. Large quantities of gas will sometimes be thus expelled. The rectal tube should be passed frequently, and this supplemented by an enema containing milk of asafœtida or turpentine. The addition of glycerin and sulphate of magnesium will sometimes bring away some fæcal matter as well as gas and give marked relief. Where great abdominal distress accompanies the distention the practitioner should be on his guard against paresis or paralysis of peristalsis. Under these circumstances the use of opium should be carefully avoided, and reliance placed upon attempts to relieve the cause of the distress, *i. e.* the presence of gas in the intestines, by enemata. The favorite enema used in my hospital service consists of sulphate of magnesium, half an ounce; glycerin, one ounce; turpentine, one drachm; dried and powdered ox-gall, one drachm; hot water, a sufficient quantity to make six ounces.

If the intestinal canal is found to be responsive to its normal nerve influence, as evinced by the passage of gas *per rectum*, the bowels should be moved after the lapse of forty-eight hours following the operation. A tenth of a grain of calomel should be given every half-hour until ten doses have been taken, and this followed by a half-ounce dose of sulphate of magnesium. If this is not efficient at the end of four hours, drachm doses of sulphate of magnesium should be administered every half-hour, supplemented by enemata, until the desired result is obtained.

Where there is some anxiety concerning the state of the bowels, or reason to fear the occurrence of intestinal paresis or paralysis of peri-

stalsis, attempts to move the bowels by means of the enemata alluded to should be made at the end of twenty-four hours. With the free expulsion of gas *per rectum* anxiety concerning the final outcome of the case is greatly lessened, and with a free movement of the bowels the patient is almost absolutely safe from immediately threatening intra-abdominal complications.

The first nourishment given should be milk diluted with equal parts of water. This is to be given in teaspoonful doses every quarter of an hour until four or five doses have been taken. If no gastric symptoms appear, the water is omitted, the time lengthened to every half-hour, and the quantity doubled at each succeeding dose until full milk diet is reached (half a pint every two hours), or as near to this amount as the patient will take.

If the wound has been infected during the operation and suppuration takes place, this should be treated upon general surgical principles. Stitch-abscess should be opened up, freely curetted, and packed with antiseptic gauze.

The sutures should be removed at the end of ten days, and the patient allowed to sit up in a fortnight, in uncomplicated cases. In suppurating cases the period of convalescence will be necessarily prolonged, and weakened abdominal walls and the fear of ventral hernia compel the patient to remain in the recumbent position for three weeks or longer.

Gauze-packing or wick-drainage must be left undisturbed for at least four days, or until the infected area has been well walled off beyond the drains. Wicking may be removed strand by strand, thus permitting the cavity which it occupies to gradually collapse.

The surgeon will sometimes be compelled to content himself with simply evacuating a pus-cavity or an encysted intra-peritoneal seropurulent collection. While this will be rarely necessary in the practice of those familiar with abdominal work, yet even with such the best interests will be served by avoiding breaking down adhesive barriers. As soon as the immediately threatening local septic conditions have subsided, if the patient's consent can be gained, the appendix may be sought for and removed, the edges of the wound freshened, and an attempt made to obtain primary union of the latter. This is to be preferred to waiting until the wound has entirely healed by granulation, and reopening the abdomen.

Grave complications following the operation when performed early in the attack, or in the intervals between the attacks, are comparatively rare. On the other hand, these are always to be apprehended when operative interference is instituted late in the disease, and will always tax the resources of both the medical and surgical therapeutist to the utmost. Either pre-operative peritonitis which the removal of

the source of the infection fails to influence favorably, or post-operative peritonitis resulting from failure, unavoidable or otherwise, to prevent spread of infection from the immediate neighborhood of the appendix in advanced cases of the disease, constitutes the source of greatest anxiety: our resources for combating this complication are unfortunately limited, and only too frequently inefficient.

Upon the appearance of the first symptoms of this complication prompt measures should be taken to procure free catharsis, for the purpose of securing drainage of the peritoneal cavity. The use of salines following the exhibition of $\frac{1}{10}$-grain doses of calomel repeated every quarter of an hour until a grain has been taken, seems to best fulfil the indications. These may be supplemented by frequent enemata containing glycerin, turpentine, and ox-gall. Counter-irritation of the surface of the abdomen has enjoyed considerable repute in times past, and this has been most frequently effected by the use of turpentine stupes. All the benefits of this treatment can be obtained in a more efficient and cleanly manner by the use of the button-shaped attachment of the thermo-cautery heated to a white heat and barely brought in contact with the surface in a great number of places.

The beneficial influences of surface applications of guaiacol for the relief of deep-seated inflammations suggests its use in peritonitis. Care should be exercised in its use in the case of old persons and young children, on account of the atrophied skin of the former and the delicate skin of the latter. It should be diluted with either alcohol or oil of sweet almonds in the proportion of 1 to 15 or 20, and pencilled over small areas at a time and covered with a cotton poultice (cotton batting covered with oil-silk).

The ice-coil has gone somewhat out of fashion. The fact that it has been deemed scarcely possible to reach and modify the inflammatory condition through the thick abdominal walls, together with symptoms of bladder-inflammation which it has been accused of producing, have contributed largely to this. I continue to employ it, however, for the reason that it assists in lowering the general temperature and gives a sense of relief and comfort to the patient; further, I have but rarely seen bladder-irritation result from its employment.

(For treatment of General Septic Peritonitis, see article upon that subject.)

Intestinal obstruction from the formation of various adhesions is a complication to be dreaded both as an immediate and a remote complication in cases operated upon late in the disease. The necessity for the introduction of drains of any kind renders this complication more likely to occur, as well as the existence of inflammatory processes which have extended from the appendix to the region about the ileo-

cæcal valve. It is highly important to differentiate in the first few days between this mechanical obstruction and that due to septic peritonitis and intestinal paralysis, for the reason that in the former immediate reopening of the abdomen and relief of the angulated or constricted intestines is indicated, while in the latter no benefit is to be derived from operative interference. In the case of mechanical obstruction the sounds produced by the movements of volumes of gas from one part of the intestinal canal above the obstruction to another can be made out with the stethoscope, while in that due to intestinal paralysis these sounds are absent. Obstruction occurring later on will be easier of differentiation. This condition may occur at any time following the operation, and is sometimes present as a complication before operation. (See article on Intestinal Obstruction.)

Ventral hernia is also a sequel which occurs more frequently in cases the subject of late operation. The presence of suppuration prevents that solid closure of the abdominal wall which is obtained when union takes place by primary intention. The muscular and fascial edges are separated by the presence of cicatrical tissue, and this eventually undergoes degenerative changes which lead, in some cases, to its almost total disappearance—that portion which unites the skin alone, in old cases, constituting the sole covering of the abdominal contents; this in time becomes attenuated, and the intestinal coils can be seen through the thin structure. While the use of support to the abdominal surface generally may give a sense of relief to the patient, this cannot be of permanent benefit, and the wearing of a pad over the cicatricial tissue may do positive harm by its pressure, thus hastening the atrophic changes which finally occur in many cases. In pronounced or extreme instances of this troublesome sequel the plan of election is to dissect out all the cicatricial tissue and bring the muscular and fascial margins together anew.

Weakening of the abdominal wall at the site of the operation is a not uncommon result of late operations in which it becomes necessary to make an extensive dissection, prolonging the incision to the extent of injuring the nerve-supply of the parts in the immediate vicinity of the field of operation. Here, although the successive layers may be firmly united as to their edges, yet there will be a general bulging upon the side operated upon, as compared with the other. The condition is irremediable so far as at present known. An abdominal support may be of service, if there is a sense of dragging. Patients, however, rarely complain of this discomfort.

From what has been said of the dangers and inconveniences accompanying or following late operation as compared with early surgical interference much difference of opinion has existed, but the following may be accepted as the views upon this question held by

those whose experience in the disease under consideration entitles their opinion to respect:

(1) Early operation means the avoidance of almost all risk in the operation itself, even in the hands of those of average or even slight experience in operative work, provided the underlying principles of aseptic operative technique be understood and acted upon. This also secures early convalescence, the avoidance of dangerous complications and sequels, and, in addition, immunity from subsequent attacks of the disease.

(2) Late operation exposes the patient to grave dangers before, during, and following the operative procedure, and demands that the latter be undertaken only by one thoroughly familiar with all of the most difficult details of the technique of abdominal surgical work. The convalescence is prolonged, and the patient not infrequently emerges from the conflict almost a complete wreck, and may require months for final restoration to health. The mortality is correspondingly high, and the operation is frequently held responsible for the fatal issue, when, as a matter of fact, the conditions found to be present are incompatible with recovery in any event. The occurrence of vicious adhesions may lead to intestinal obstruction at any time during the life-time of the patient. The presence of ventral hernia may require a subsequent operation for its relief. In not a few instances the surgeon is compelled to leave the appendix behind, thus rendering the patient liable to subsequent attacks, the only other choice being that of submitting to a secondary operation.

While it may be said with truth that some cases operated upon might have recovered without operation, this consideration is more than balanced by the fact that no one can ensure this to the patient in any given case, much less promise him immunity against subsequent attacks, as well as the fact that the mortality of cases operated upon early, or when the infection is limited to the organ itself, is not higher than one-half of 1 per cent. in competent hands. When the patient recovers without operation the result is attributable to the fact that the disease was not beyond the power of nature to control, and not to the influence of remedial agents, for the reason that there is no drug known whose direct action is such as to effect any favorable change whatever in the inflammatory process in which the organ is involved. Finally, in cases in which recovery ensues under purely medical treatment, the patient must always dread a recurrence of the malady. The delay which medical practitioners frequently counsel in cases of appendicitis is largely responsible for the many valuable lives that have been lost from the disease since its dangerous character has become known, as well as from operative attempts instituted at a late stage of the disease, which have proved ineffectual.

The Non-operative Treatment of Appendicitis.—The non-operative or so-called medical treatment of this disease will be called for under the following circumstances:

(1) When the conditions under which the patient is placed are such as to prohibit the employment of skilled surgical aid at a time in the course of the disease when the greatest skill possible is necessary in carrying the operative procedure to a successful issue, namely, when the infection has passed beyond the limits of the appendix itself and has involved the surrounding parts, although it is at this very time, save in but a few exceptional instances, that operative interference is really most imperatively demanded.

So long as the infection is confined to the organ the operative procedure to be instituted is the simplest of all those for which abdominal section is demanded. The route is direct, the large intestine easily identifiable, the caput coli readily found, and the vermiform appendix of the cæcum brought into the abdominal wound with ease and ligated and excised. With strict limitation of the infectious process to the organ itself, with no ulceration or perforation of the appendix, and in the absence of infected serum in the abdominal cavity and suppuration in the adhesions, if such have been formed, it is still possible for the case to go on to recovery with no complicating sequelæ, although an exceptionally large and varied experience in the treatment of appendicitis impels me to insist at every opportunity that there is no means of knowing, in a given case, whether or not such a favorable course will be followed. In the majority of cases, however, the medical practitioner is quite unwilling to pass the case over to the surgeon, or even to interefere operatively himself, if he be surgically inclined, although there can be no question that, with the observance of proper aseptic precautions, many cases which perish yearly would be saved by operation; as well as that others, which pass through a fearful ordeal of suppuration and finally recover, would be brought to a safe and prompt convalescence, if the surgical procedure could be instituted at the golden moment.

On the other hand, there comes a time in a large number of cases when it becomes an extremely difficult task for the most skilled surgeon, versed in all the special technique of abdominal section necessary to prevent infection of the peritoneal cavity both from the infectious processes present in the appendix and its neighborhood, as well as from without, to deal with the conditions present in a manner at all calculated to bring the case to a successful issue. This not only involves the greatest possible care and skill on the part of the operator himself, but presupposes a degree of skilled manipulation on the part of at least one assistant, not easily obtainable in districts remote from the great centres of surgical activity. The operator must

rely more or less upon his chief assistant for the proper protection of the surrounding parts from contamination arising from contact with material at the site of the original focus of infection. Escape of coils of intestine from beneath the protecting layers of gauze must be guarded against while the operator is at work isolating the appendix and bringing it within reach for the purpose of removal; and in the absence of a trained assistant reliance must be placed upon one who, not realizing the importance of his task, fails at a critical moment, and by an unguarded or awkward movement permits the intestines to both obscure the field of operation and become infected at the same time. Any surgeon who has had much to do with the class of cases under review will realize the importance of having an intelligent and appreciative brain and skilled pair of hands opposite him, and realize how heavily he is handicapped in their absence. What, then, must be the difficulties to be encountered by the practitioner under these circumstances who has never opened the abdominal cavity at all, or who, having done so, has never been called upon to face violently infectious conditions, with adhesions easily broken down, and all the possibilities of infection of the general peritoneum continually present!

Therefore, under the circumstances of a mild attack, and in the absence of threatening symptoms, as well as with a severe attack at hand and the actual presence of the latter, if the patient be located at a point remote from surgical aid he will be likely to be treated non-operatively. For this reason it behooves us to carefully consider what course the attending physician should pursue in order to give his patient the best possible chance, next to that of operative interference, for recovery.

(2) There is a class of cases in which it may be deemed best to defer operative interference until a later period of the disease, holding the latter in reserve. These are cases in which the patient's general state will not admit of interference, and in which the general disturbance is out of all proportion to the local conditions. High fever, a rapid pulse, and great prostration may be present, and yet the local disease be comparatively insignificant. This is particularly apt to be the case during pregnancy, and the careful and experienced clinician will be on his guard, knowing the unfavorable prognosis to be apprehended with this condition complicating an attack of appendicitis, whether the latter be treated operatively or expectantly.

(3) Cases occasionally come under the care of the surgeon in which the conditions present are such as to lead him to believe that the risks involved in operating can scarcely be exceeded by those taken in declining to open the abdomen and treating the patient expectantly, however hopeless the outlook may appear. Two cases have come

under my observation and subsequently recovered which exemplify this proposition. Both occurred in children, and in both the distended abdomen, drawn and pinched features, muddy-colored surface, and rapid, feeble pulse seemed to portend a speedy dissolution. In one of these cases I explained the grave risks to be taken in the event of opening the abdomen, as well as the highly probable fatal issue if the patient was treated non-operatively, whereat the friends declined to permit the operation to be done. The final recovery of this patient impelled me to advise against interference in a subsequent case, similar in character, this patient also recovering.

In both of these cases my reasons for not insisting upon operation, as in the first case, and of advising against it in the second, were based upon the belief that the patients would scarcely be able to withstand the effects of the anæsthetic and shock combined. The attempt to eliminate the first-named factor by making the abdominal section under cocaine anæsthesia has simply resulted in greatly enhancing the effects of the last, all cases so operated upon having perished very shortly following the operation. The truth of the matter is that under these circumstances the patient is staggering along under a burden which he is just able to carry and live; any attempt at interference must necessarily increase the burden temporarily, and he dies before the beneficial effects of getting rid of a portion of his original burden can be realized.

Assuming the views here expressed to be correct—and in the present state of our experience they can scarcely be denied at least earnest consideration on the part of all—there is scarcely room for doubt in the minds of those who have been brought much in contact with appendicitis, that surgical measures, and these alone, are competent to deal effectively with the disease when the latter is progressive in character. In mild cases of catarrhal or endo-appendicitis with but slight interference with the blood-supply and in the absence of virulent infection, the inflammatory action may not extend beyond simple thickening of the mucosa, or at the most involve but slightly destructive changes, and hence these cases should quickly clear up under saline purgation and rest in the recumbent position. But even here there is a source of danger not heretofore sufficiently dwelt upon, and which is illustrated in a case coming under my care, in which, with a history of several preceding indubitable attacks of appendicitis, I was impelled to open the abdomen promptly during an exceptionally mild attack. The conditions present were such as to fully justify the procedure. The appendix was greatly distended with a muco-purulent secretion almost to the point of rupture (empyema of the appendix), and with practically no adhesions present. Upon examination after removal it was found that communication with the

cæcum had been entirely shut off by a stricture—the result of a former attack—at the appendiculo-cæcal orifice, constituting a most dangerous condition of affairs.[1]

The first point upon which the practitioner should bestow his attention upon being called to a case of appendicitis is the state of the bowels. If these are constipated an enema should be given and this followed by a dose of sulphate of magnesium or other saline cathartic, since these drugs possess the property of not only emptying the intestinal canal, but likewise of effecting drainage from the neighboring peritoneal structures by endosmotic action. To be a safe procedure, however, this must be instituted at the very commencement of the palpable symptoms. Van Cott has shown that neural and vascular changes may precede the onset of the acute symptoms, and my own experience teaches me that these may lead to rapidly gangrenous condition.[2] With these at hand violent catharsis may invite early perforative peritonitis. Therefore, if prompt emptying of the intestinal tract cannot be accomplished, it is better to forego entirely this portion of the treatment until opportunity has been afforded for the formation of protective adhesions, which may take several days. In any event an enema to clear out the lower bowel should always precede the administration of the cathartic. If the case is a progressive one and suppuration in the appendix or surrounding adhesions takes place, catharsis should also be carefully employed, if at all, for the reason that if these adhesions are rendered tense by the accumulation within their boundaries they may be easily broken down by forced peristalsis, and secondary rupture into the peritoneal cavity take place, with resulting general septic peritonitis. After the first few days the bowels may be moved by enemata daily, all straining efforts being avoided.

The patient should not be permitted to rise from the bed either to urinate or defæcate. This rule is imperative, and no argument or insistence on the part of the patient should induce the practitioner to accept the responsibility of movements on the part of the patient that may easily lead to his destruction through the supervention of general peritonitis following either primary perforation or secondary rupture. The same rule should apply to voluntary muscular efforts in bed, such as rising and turning over. None but absolutely necessary movements are to be permitted, and these should be entirely of a passive character, *i. e.* with the assistance of another. The medical attendant should ever keep before him the vision of an appendix violently inflamed, gangrenous in whole or in part, and lying loose in the cavity of the peritoneum waiting for some more or less violent

[1] *Medical Record*, Nov. 7, 1896.

[2] *A Treatise on Appendicitis*, by George R. Fowler, M. D., Philadelphia, 1894.

effort on the part of the patient or forced peristaltic movement of the surrounding intestinal coils to empty its death-dealing contents into the peritoneal cavity. Even when all seems to be going on favorably the same caution should still be exercised, for the reason that, even if the inflammatory condition of the organ is subsiding, an encysted sero-purulent collection in the surrounding area, resulting from a perforation that has healed, or an infection through the circulatory channels without perforation, will do almost, if not quite, as much damage as a primary perforation, if its barriers are broken down and its contents permitted to invade the peritoneal cavity. Rest, therefore, absolute and prolonged, should be insisted upon in a most positive and unequivocal manner by the medical attendant.

It is easier to state the contraindications to the employment of opium than to lay down rules for its use in appendicitis. It is a two-edged sword that cuts both ways, and, unfortunately, its keenest edge is turned in the direction of the patient's comfort. There is an almost irresistible impulse on the part of the practitioner to administer a sufficient amount of the drug to allay the pain completely. If the question of operation has been discussed and definitely disposed of in the negative, and the medical attendant is fully aware of the fallacies in the prognosis which this drug gives rise to—in other words, if he is not misled by the apparent improvement in the symptoms which follows its administration, and is on his guard against indiscretions on the part of the patient into which the latter is led by what to him appears to be an abatement of all the uncomfortable features of the disease—then, and only then, is its employment justifiable, to a limited extent, if other measures fail and the patient is being harassed and worn out by pain and restlessness. If the operative procedure is still under consideration, and the question of its application to the case in hand not yet settled, but, on the contrary, is made to depend upon the possibilities of improvement or otherwise within the next few hours, then, in order to form a fair estimate of the progressive or non-progressive character of the attack, and in the patient's own best interests, it is better not to mask the natural symptoms. With its complete withdrawal and steady improvement following there can be but slight opportunity for error, particularly if the symptom of localized tenderness be carefully watched and estimated at its full value. Under these circumstances the question of operative interference can be intelligently discussed, if indeed it can be said to be open for discussion at all after the first twenty-four hours of the existence of the disease with no natural and material amelioration in the symptoms. On the other hand, if opium or its preparations are permitted to mask the course of the disease the practitioner must remain more or less in the dark as to its actual possibilities, and thus be the

more readily deceived as to the indications for surgical interference, and in cases in which operation is refused, or deemed impracticable either because of the environment or other equally good reason, as to the actual state of affairs within the patient's abdomen and the necessity for constant vigilance against the occurrence of a catastrophe.

In cases in which it is finally decided to trust to nature's efforts to resist the further invasion of the disease (for, after all, this is what treatment by drugs amounts to so far as "cure" of the appendical inflammation is concerned), then it will become necessary to relieve the patient's sufferings primarily, and secondarily to secure that rest of the inflamed parts surrounding the original focal lesion so absolutely essential to the formation and maintenance of proper adhesions for the protection of the peritoneal cavity pending the subsidence of the appendicitis itself. The treatment, under these circumstances, becomes the treatment of a localized infectious peritonitis in which it is believed with reasonable probability that the lesion is of a suppurative character and must be kept strictly within its then present limits; the judicious employment of opium, *i. e.* the smallest possible dose that will keep the patient in some approach to comfort, is to be chosen and steadily adhered to save under circumstances of emergency, and is to be continued until the necessity for its employment has passed away. In its withdrawal some substitute may be given, of which bromide combinations serve the best purpose. Under the watchful care of an alert practitioner opium may, with proper precautions, become an unmixed blessing in the treatment of appendicitis in the class of cases in which its employment is admissible; in the hands of one less vigilant and unmindful of its treachery its becomes a Lorelei beckoning on the innocent victim to his destruction.

With the occurrence of an inflammatory mass in the right iliac region (and this should be sought for occasionally, the gentlest manipulation only being admissible, examination by percussion being largely substituted for palpation) the watchfulness of the medical attendant must be redoubled. The more acutely painful symptoms now subside, and, since the adhesions have become well formed, there is a double indication for the lessening of the dose, or the withdrawal of the drug altogether save for the purpose of allaying impatience and restlessness on the part of the patient, or for securing sleep at night. These may perhaps be as well secured by small doses combined with one of the bromides, or the latter may be found sufficient alone.

Local applications are of but little use in arresting the disease, yet the application of a small ice-water coil, or a rubber bag filled with ice, is a favorite application with many medical men, and occasionally patients declare that it affords relief from pain. For this reason alone

it should be employed, since it thus enables the attendant to cut down still further the amount of opium employed.

During all this time the nutrition of the patient must be kept up and his general system fortified against the septic material which is being slowly fed into his circulation and distributed to his tissues, or eliminated by the natural outlets. The skin and kidneys are important agents in the last-named particular, and should receive attention. The food should be such as will leave the least possible amount of residuum and still be sufficient for the needs of the system, having in mind the undesirability of administering cathartics for the forced emptying of the intestinal canal. Milk, white of egg in water, and farinaceous gruels and meat broths are indicated, sufficient variety being furnished to make these acceptable to the patient. Digestive disturbances should be met by a change in the diet, if one or two of the allowed articles only have been used, and the administration of remedies such as hydrochloric acid and the digestive ferments.

Febrile disturbance is not usually a grave feature of the disease, and hence antipyretics are but seldom demanded. Their use, like opium injudiciously administered, only tends to mask the real conditions. If sepsis is present the synthetically prepared antipyretics, such as phenacetin, antipyrin, and antifebrin or acetanilid, only have the permanent effect of weakening the cardiac muscle, and hence will be harmful if given. Tonic doses of quinine are admissible, and, according to the dose given and the susceptibility of the patient thereto, the antipyretic action obtained properly discounted in estimating the patient's condition as based upon the temperature indications.

The use of strychnine has a proper place in the therapy of appendicitis, and this drug may largely replace the employment of alcoholic stimulants. With failing strength its employment, in $\frac{1}{30}$-grain doses, in connection with quinine, digitalis, or sparteine is useful. Nitroglycerin with caffeine aids the action of the kidneys in their eliminative function by raising the blood-pressure and lessening the resistance in the capillary circulation, and hence these drugs are useful both in this respect as well as in their influence upon the flagging heart.

The occurrence of rupture of an intra-peritoneal encapsulated abscess is marked by the sudden subsidence of the inflammatory mass and symptoms pointing to the route chosen by nature in getting rid of the offending pus. If this be into the peritoneal cavity the characteristic symptoms of acute general peritonitis soon manifest themselves. There is an accelerated pulse-rate, great abdominal pain, accompanied by an anxious countenance and followed by tympanitic distention and vasomotor paralysis. If by the intestinal canal, there

soon appears a diarrhœa, or at least several loose discharges, according to the amount of pus which the abscess-cavity contained, with the indubitable evidences of the presence of pus in the stools. If by the bladder, pus, and in some instances fæcal matter, if both routes have been chosen, will be present in the urine. Under these circumstances symptoms of cystitis make their appearance and require treatment. In the female the discharges may take place from the vagina. The collection may make its way through the diaphragm and perforate the base of the lung after the formation of pleural adhesions, and escape into a bronchus. In at least one instance with which I am familiar the occurrence of this latter accident was followed by the patient's sudden death. He was literally drowned by the rapid flow of the pus. The pleural cavity may receive the collection forced upward by the pressure from below, and an "empyema necessitatis" follow, if the patient survive. The pus may escape in a post-peritoneal direction and invade the deep structures of the back, or follow the iliac vessels over the pelvic brim into the thigh and simulate a psoas abscess in its final pointing. Least likely of all, it may discharge into the abdominal wall and terminate as a parietal phlegmon, pointing by preference in the neighborhood of the umbilicus.

The treatment to be pursued under these varying circumstances of spontaneous evacuation will vary with the route chosen by the advancing pus. If the direction taken be into the peritoneal cavity the patient's doom is sealed, and, beyond the benefits to be derived from euthanasia, the medical attendant's functions cease: opium in sufficiently large doses to tide the victim over the last agonies is alone indicated, from the purely medical standpoint. Even surgery offers but little hope, for the patient's condition at this stage of the case is generally such as to prohibit the use of an anæsthetic, much less will it permit the additional shock incident to opening the abdomen in the face of profound collapse and general sepsis, which rapidly supervene.

If the pus is evacuated through the bowels, beyond an occasional low enema nothing need be done. If the communication between the fæcal current and the abscess-cavity is into the small intestine reinfection of the latter usually takes place, and this may be repeated again and again until either the patient's strength is exhausted or the surgeon is called in to right the matter by providing a route for the escape of the pus by means of abdominal section and drainage. The fæcal fistula which follows is best treated by a subsequent plastic operation. If the abscess-cavity has emptied into the colon or rectum the outlook is more favorable, for by the use of enemata the lower bowel can be kept empty and the fæcal current diverted from the opening in a certain proportion of cases. Cathartics are not to be given under these circumstances, the object being to avoid as far as

possible the presence of liquid fæcal matter in the invaded bowel; otherwise the conditions present in the small intestine will be produced and healing of the communication delayed, or prevented altogether. Even with all the care in this respect possible, reinfection is apt to occur and an operation become finally necessary.

If the bladder has been invaded the resulting cystitis must be met by washing out the bladder occasionally by means of boric-acid solutions. The bladder should not be entirely filled with the solution. Infection of one or both kidneys may result from failure to keep the cystitis within bounds or the bladder disinfected. If the intestine and bladder are both invaded these efforts must be redoubled. Surgical interference (suprapubic cystotomy) alone will suffice when this latter complication arises.

The vaginal route is perhaps the most favorable of all those mentioned. The opening is usually in the vault and affords direct drainage, and borico-salicylic acid (Thiersch's) solution, used as a vaginal douche, fulfils all the indications.

The diaphragmatic route, next to that leading into the peritoneal cavity, is the least favorable. In addition to the immediate dangers from flooding the respiratory tract, those arising from septic pneumonia are to be apprehended. The prognosis of empyema resulting from the presence of the discharged pus, as well as the suppurative process set up in the pleura itself from infection, is most grave and is to be met by operative procedures designed to evacuate the collection and provide free drainage at once.

The escape of pus into the post-peritoneal connective tissue and its invasion of the deep structures of the back is soon followed by grave constitutional disturbances of septic origin. If the pus makes its way along the route followed by the vessels and appears in the thigh, the collection may be evacuated by an incision and drainage established. The same course is to be followed in case the route followed by the pus leads into the abdominal wall.

Other complications to be feared are hepatitis of septic origin; septic emboli form in the mesenteric veins and are swept into the portal circulation. This is announced by pain and tenderness in the region of the liver, jaundice more or less pronounced, and increased constitutional disturbance. The outlook under these circumstances is grave, although the case is not necessarily a hopeless one. No specific medication will be of use. Suppurative hepatitis is to be feared, and occurs in a certain proportion of cases.

In cases ending in pyæmia every effort should be made to maintain the patient's failing powers. The free administration of malt liquors is often of service. Isolated foci of pus should be opened early, even when these attack the joints. Quinine is of service.

PARATYPHLITIC ABSCESS.

While the great majority of cases of supposed typhlitis and perityphlitis, as well as typhlitic tumor and paratyphlitic abscess, have their origin in inflammation of the vermiform appendix, yet cases of suppurative inflammation in the right iliac fossa, originating in the neighborhood of the cæcum or caput coli, do certainly occur in which the operative procedure discloses a normal appendix, or even after the latter has been removed for appendicitis. This is true, in spite of the more generally received opinion that abscesses in this region are exclusively of appendical origin—an opinion so widespread that recent writers, as a rule, entirely ignore the possibilities of their occurrence from other origin. Between this and the opposite extreme, held by Dupuytren and afterward put forth by Albers, there is probably ground for dissent from both opinions.

Paratyphlitic abscess is a suppurative inflammation in the connective tissue about the cæcum. This may occur in the normal structures or in the adhesions which have previously formed from inflammatory conditions of the cæcal wall (typhlitis) and its serous covering (perityphlitis). The typhlitis itself may have its origin in fæcal accumulation (stercoral typhlitis of Lenander), this tending to a catarrhal inflammation, limited to the mucous membrane, or to a parietal typhlitis whose seat is in the interstitial or intermuscular structure of the wall of the cæcum, with engorgement of the vessels and the presence of an exudate in the perivascular spaces. Or, it may occur from nutritive disturbances of the bowel-wall, following (1) vascular changes (endarteritis obliterans and thrombosis or embolism of the vessels of the meso-cæcum), with resulting ulceration or the occurrence of gangrenous areas with perforation; or (2) neural lesions with consequent trophic changes in the bowel-wall. Finally, it may result from the action of some foreign body or the presence of dysenteric, typhoid, or cancerous ulcers. The mechanism of the infection consists, in those cases in which no perforation exists, in bacterial migration, the causative lesion robbing the intestinal wall of its natural property of intercepting the passage of micro-organisms through its tissues, and, in the cases in which perforation occurs, in direct infection from contact with the fæcal contents of the bowel.

Symptoms and Course of Paratyphlitic Abscess.

The symptoms of paratyphlitic abscess are the presence of a tumor in the right iliac fossa, the appearance of which has been preceded by the more or less sudden occurrence of pain and tenderness in this region. These, in their turn, may have been preceded by loss of appetite, disturbances of digestion, and constipation, and followed by

slight fever, and occasionally vomiting. If the case is seen in the stercoral typhlitis stage a doughy mass may be very readily felt in the neighborhood of the right iliac fossa. Considerable distention may take place in the course of the case from accumulation of fæcal matter and gas. In exceptionally severe cases intestinal obstruction may occur. Localized peritonitis is always present. The suppurative collection may perforate posteriorly and invade the retro-peritoneal connective tissue and simulate a perinephritic abscess, or follow the space between the lateral abdominal wall and the colon and perforate the diaphragm. It may invade the sheath of the psoas muscle and find its way to the thigh. Flexion of the right thigh will be present in these cases.

Diagnosis.—Paratyphlitic abscess is of exceptional and even very rare occurrence as compared with the frequency of appendicitis, from which disease it is to be carefully differentiated. It is of less abrupt onset than the latter, and the pain is less severe and more distinctly localized from the commencement. The general symptoms are less pronounced, as a rule, although an appendical lesion may go on to perforation and lead to general septic peritonitis without serious preceding constitutional disturbances. The tumor in paratyphlitic abscess, in cases of stercoral origin, is present from the commencement of the symptoms, while in appendicitis there is usually seen in acute cases supervening upon a chronic condition following a former attack, a distinct period of from two to four days, between the onset of the attack and the appearance of a tumor. In typhlitic tumor the mass is sausage-shaped, situated at the site of the cæcum, can be indented by the finger, and is less tender than the tumor of appendical origin, which may be lower down below the level of the anterior superior spinous process of the ilium, is irregularly shaped, and, unless the symptoms are masked by opium, exquisitely tender. When suppuration has taken place in the paracæcal structures attempts to establish the differential diagnosis will be futile save through an operative procedure. In the simple catarrhal and even sometimes in the parietal form of typhlitis the symptoms are promptly relieved if the bowels are well acted upon by a laxative. Cases of paratyphlitic abscess resulting from perforation following ulcerative action, gangrene of the bowel-wall, and foreign bodies, are usually impossible of differentiation from appendical lesions. In case of doubt it is better to lean to the side of appendicitis.

Prognosis.—The prognosis is favorable if the suppurative process is not permitted to find its way into regions inaccessible for purposes of complete drainage after incision.

Treatment.—Complete rest in bed, the administration of a saline cathartic, and the local use of an ice-bag will be appropriate measures

of treatment if instituted in the stage of fæcal accumulation, and before the occurrence of localized peritonitis. If the latter supervene opium may be given in cautious doses. As soon as suppuration occurs the collection is to be evacuated. This may frequently be done without invading the peritoneal cavity by making the incision as for ligation of the epigastric artery, and crowding back the peritoneal fold, so as to gain access to the abscess-cavity.

In cases with sudden onset, in which perforation has probably already occurred, the operation should be promptly done as for appendical lesions. In all cases in which the fullest and most positive evidence of a preceding stercoral typhlitis cannot be obtained the patient should be given the benefit of the doubt and the case treated surgically as for appendicitis.

INTESTINAL OBSTRUCTION.

For purposes of general classification intestinal obstruction may be divided into the following:

1. Constriction of the bowel from without (strangulation).
2. Obstruction from displacement and simple flexure (angulation).
3. Obstruction from twist and complex flexure (rotation).
4. Obstruction from blunt pressure from without (compression).
5. Obstruction from closure of the intestine from within (coarctation).
6. Obstruction from plugging of the intestine from within (obturation).
7. Tract of bowel paralyzed (dynamic).

Two, or even more, of these forms of obstruction may be combined in the same case.

The following clinical forms are distinguished:

1. Internal strangulation.
2. Intussusception.
3. Volvulus.
4. Congenital occlusions and acquired strictures.
5. Fæcal obstruction.
6. Foreign bodies.

1. Intestinal Strangulation.—In this form of obstruction the constriction or occlusion of the bowel takes place from its peritoneal surface. It includes (*a*) obstruction by pressure of adventitious tissue or bands from pre-existing peritonitis, fœtal or otherwise, adhesions of inflammatory origin causing abnormal displacements and fixation of the intestinal tube and consequent "kinking" or angulation; (*b*)

obstruction from the presence of the remnants of the omphalo-mesenteric duct known as Meckel's diverticulum; (*c*) the presence of openings in adjoining folds of peritoneum, such as mesenteric and omental slits, into which a knuckle of intestine is forced and becomes imprisoned; (*d*) appendical inflammatory lesions in which the inflamed appendix becomes adherent in such a position as to partially surround a portion of adjoining intestine in a constricting loop, or acts as a band and produces obstruction by pressure; and finally, (*e*) true internal hernia, a portion of intestine entering the duodeno-jejunal fossa and there becoming incarcerated by the musculus suspensorius duodeni of Treitz acting as a band.

2. **Obstruction arising from Intussusception.** — In this form there is invagination or telescoping of one part of the intestine into another, due to irregular and forced peristalsis. The invagination always occurs from above downward, and includes the following varieties: (*a*) colic, in which the invagination is limited to the colon; (*b*) ileo-cæcal, in which the ileum is prolapsed into the ileo-cæcal aperture; (*c*) enteric or ileal, when the small intestine alone is involved; (*d*) the colico-rectal, the colon descending into the rectum; (*e*) the rectal, the rectum invaginating into itself.

3. **Volvulus.**—In this form a twist of the bowel upon its mesenteric axis occurs. Its location is usually at the sigmoid flexure. The twist becomes more pronounced as distention of the bowel above the lesion progresses. Nutritive changes in the intestinal wall occur early and bacterial migration and septic peritonitis follow, as a result of which the parts involved become firmly fixed in their abnormal position.

4. **Congenital Occlusions and Acquired Strictures.**—These include (*a*) absence of a portion of the intestinal tube from arrest of or imperfect development, such as imperforate anus, absence of or defective union between the sigmoid flexure and the rectum, the pylorus and duodenum, etc.; (*b*) strictures from morbid growths, either malignant or benign, of which the former are by far the most frequent; (*c*) cicatrical contraction from healed typhoid and other ulcers; (*d*) occlusion arising from the pressure of pelvic and abdominal tumors, and from the presence of inflammatory exudates about the bowel.

5. **Fæcal Obstruction.**—Accumulation of fæcal matter in an isolated portion of the intestinal canal arises from a local arrest of peristalsis, and results, if sufficiently prolonged, in paralysis of the involved portion of bowel, and finally, with increased size of the mass and its desiccation and hardening from absorption of its fluid constituents, obstruction from plugging of the bowel and stenosis of the adjacent intestinal canal. Its most frequent seat is the large

intestine in the neighborhood of the caput coli and cæcum. Septic inflammatory conditions may arise when the wall of the gut is greatly distended or under circumstances of pressure from exceedingly hard masses within the bowel and resulting interference with the nutrition of the bowel-wall and bacterial migration. It follows most frequently a constipated habit, and is observed oftenest in females and in the aged. It may be due remotely to congenital conditions, and is favored by sedentary habits. Other predisposing causes are hysterical and hypochondriacal conditions and spinal cord affections.

6. **Foreign Bodies.**—Obstruction by foreign bodies includes that which arises from gall-stones, enteroliths, and masses of lumbricoid worms, as well as substances swallowed, such as coins, buttons, etc., and certain medicinal substances (magnesia and bismuth). Gall-stones are most frequently arrested in the ileo-cæcal region and enteroliths elsewhere in the small intestine.

Symptoms and Course of Intestinal Obstruction.

Intestinal obstruction may be acute or chronic in its onset and course, according to the cause of the obstruction. Further, there may be present symptoms of a chronic or slowly progressive character for a time, these being followed by symptoms pointing to the supervention of acute obstruction.

Acute obstruction is characterized by abdominal pain, nausea and vomiting, tympanites, and inability to pass gas by the rectum after the point below the obstruction has been emptied; occasionally tenesmus, when the obstruction is low down, and sometimes the presence of a dull tumor. Distended coils of intestine sometimes elevate isolated portions of the abdominal wall, forming a tympanitic tumor. Moderate rise of temperature may be present.

In chronic obstruction due to impacted fæces diarrhœa may be present at first. The mucous membrane in the neighborhood of the impaction becomes the site of a catarrhal inflammation and the secretion furnished passes alongside of and through the mass, carrying with it some fæcal matter. This, however, soon ceases and symptoms of complete obstruction slowly occur. There is a sense of fulness and weight in the abdomen, with general uneasiness, loss of appetite, foul taste and furred tongue, and pain, induced by pressure, referred to the distribution of the sacro-lumbar nerves. Swelling of the abdomen occurs, and, sooner or later, a tumor is made out. A general lethargy is followed by prostration, or symptoms of obstruction of an acute character may supervene. When the obstruction is due to malignant disease of the bowel-wall, there will have existed constipation previously, and, in isolated instances, some pain and localized tenderness which is increased by the administration of cathartics. There is

increasing difficulty in effecting movements of the bowels, with loss of weight and strength, and anæmic dyscrasia.

Hiccough may be present in either form. Fæcal vomiting, and expulsion of brownish-covered serous contents of the small intestine without apparent effort, occur finally in nearly all cases of complete obstruction of the small intestine. Fæcal vomiting is not nearly so constant a symptom in obstructive conditions of the large intestine, although in volvulus at the sigmoid flexure it may be an early and prominent symptom. The evidences of tumultuous peristalsis in the shape of gurgling sounds are sometimes apparent both to the patient and the attendant, and when not so apparent may be obtained by auscultation. The stools are stained with blood in malignant disease of the lower bowel, and tenesmus, followed by bloody mucus in the stools, is especially characteristic of intussusception, although not always present. Localized peritonitis results from bacterial migration and infection from the interior of the intestine following disturbances of the normal physical characters of the intestinal wall from whatever cause. This occurs with especial rapidity in volvulus, the twist of the mesentery interfering early with the nutrition of the bowel. Fatal cases of intestinal obstruction are marked by typical and early collapse, the effects of the stercoræmia being particularly manifested upon the nervous system. There is vasomotor paralysis, a bluish-red color of the surface, lowered temperature, and feeble pulse.

In cases primarily acute the practitioner may suspect either internal strangulation, internal hernia, intussusception, or volvulus. In all cases the usual sites of hernia, viz. the inguinal, umbilical, and crural outlets, as well as the unusual localities in which this occurs, such as the perineum, the obturator foramen, and lumbar region, should be interrogated. In chronic obstruction cicatricial narrowings, stricture from malignant and benign neoplasms of the bowel-wall, occlusions from tumors or inflammatory processes, and foreign bodies or fæcal impactions, are each to receive due consideration in the differentiation.

It is not usually difficult to reach a conclusion that obstruction actually exists, although acute enteritis, acute poisoning, and strangulated hernia have all been mistaken for intestinal obstruction. The most frequent diagnostic errors, however, relate to appendicitis and peritonitis (see pages 576 and 586).

The anatomical diagnosis, save in indubitable cases of fæcal impaction, is always difficult and frequently impossible without the aid of exploratory abdominal section. The seat of pain in all varieties and situations of intestinal obstruction is apt to be at or near the umbilicus, and when not so located is generally diffused. Tenderness

is not always present, and in any event its situation is barely suggestive, much less diagnostic. From the greater frequency of fæcal vomiting in cases of obstruction in the small intestine, this symptom may be of some service in the differentiation. A tumor felt by the finger in the rectum or vagina is suggestive of intussusception when acute symptoms are present. Digital exploration of the rectum may reveal a stricture or other evidence of disease, if this be within reach. On the other hand the lesion may be located in the large intestine high up, or in the small intestine, in which case it will not be accessible to digital exploration. Exploration with the hand in the rectum is a procedure the results of which, as a diagnostic measure, have not justified the risks taken in its employment. The Sims position used in gynecological work is convenient for digital, and the knee-elbow position for instrumental, examination. In fæcal obstruction the uneven mass may be sometimes felt in the course of the bowel.

Obstruction high up in the small intestine is accompanied by scantiness of urine and moderate distention at the upper portion of the abdomen. There is flatness below and in the sides. Small movements may be obtained by enemata, but the distention will not be influenced thereby, although the latter will be temporarily diminished by vomiting, washing out the stomach, or the expression of large quantities of gas *per os*. With duodenal and jejunal obstruction the vomiting is not fæcal. When the obstruction is in the ileum the distention is central until the distended coils of small intestine overlap the colon; the vomiting becomes fæcal finally.

If the obstruction is in the lower portion of the colon there may be tenesmus and bloody and mucous discharges. Some writers lay stress upon increase of indican in the urine. The differences between the extent of the tympanitic distention present in obstruction of the small intestine and that of obstruction in the colon, save very early in the former, are not sufficiently great to be diagnostic. Attempts to measure the capacity of the portion of the large intestine below the seat of obstruction, and thus form some estimate of the location of the latter when this is believed to be in the colon, are sometimes made, but, as a rule, with only indifferent success. The large intestine of the adult, if filled to the ileo-cæcal valve, will hold about six quarts. Since the fluid will not reach beyond this point, theoretically one should be able to estimate the seat of the obstruction in the colon by the amount of water which can be introduced. In the absence of accurate knowledge of the capacity of the colons of children and infants considerable danger would be invited by persistent efforts to fill the bowel, as rupture might take place, particularly after nutritive changes had occurred in its walls. Pressure from a height of three feet in an infant, and eight feet in an adult, is within the limits of safety.

In order to eliminate the voluntary efforts at evacuation on the part of the patient the latter would have to be anæsthetized. To prevent the fluid from returning the buttocks should be pressed closely together about the injection-tube. The patient is to be placed upon the right side, or, better still, inverted. With all precautions the results may be misleading, since one-fourth of the amount supposed to represent the entire capacity of the large intestine to the ileo-cæcal valve has been introduced into the rectum alone. It is said to be possible to demonstrate the arrival of the fluid in the cæcum by auscultation.

In considering the cause of the obstruction a knowledge of the proportion of cases in which the different forms of obstruction is found upon autopsy is useful. 35 per cent. of all cases are found to be due to intussusception, and about the same proportion to strangulation by bands, inflammatory adhesions, appendicular lesions, diverticuli, and true internal hernia. Of the remaining 30 per cent. fully one-half are due to volvulus, 8 per cent. to obstructions by abnormal contents or foreign bodies, of which gall-stones are the most frequent, and 6 per cent. to tumors, cicatricial contractions, and strictures from neoplasms of the bowel-wall.

If the anatomical diagnosis can be assured and the large intestine determined to be the seat of the obstruction, about one-half of the cases will be found to be due to intussusception. Volvulus is next in frequency (30 per cent.), the remainder being accredited to tumor-pressure and strictures from morbid growths in the bowel-wall. If in the small intestine, about three-fourths of all cases occurring in this locality are due to strangulation. Next in frequency comes obstruction by gall-stones (14 per cent.). Volvulus is still less frequently met with in this locality, although cases are occasionally observed. Owing to the greater mobility of the small intestine occlusion from tumor-pressure is scarcely ever observed. About 1 per cent. of the cases of obstruction about the immediate neighborhood of the ileo-cæcal valve are due to stricture.

Volvulus rarely occurs under forty, and intussusception over thirty. The latter is much more likely to be present in children, and, with its abdominal tumor, bloody stools, and rectal tenesmus is much more easily recognized than any of the other forms, save only cancer, which is essentially a disease of middle adult and advanced life. 75 per cent. of the cases of intussusception occur at or near the ileo-cæcal junction, and 50 per cent. of the cases of volvulus are found near the sigmoid flexure. Stricture due to malignant disease as well as from other causes is likewise most frequently at or below the sigmoid, and may sometimes be felt by digital examination. Twists at this point do not usually convey any definite information to the examining finger.

Vomiting.—Information may be derived from a study of the symptom vomiting. In obstruction in the duodenum and jejunum this may occur early, but is not fæcal in character. If in the ileum or at the lower end of the small intestine, it occurs early, is severe and persistent, and becomes fæcal only later on in the attack. If in the large intestine it is longer delayed, is less severe, and may not become fæcal until later, if at all.

Pain.—The pain, in strangulation, is an early and prominent symptom as compared with the other forms of obstruction. The peritonitis which follows volvulus is more sudden in its onset and spreads more rapidly than in the other forms. In strangulation this occurs later in the case, and may be absent altogether, the patient dying from toxæmia of intestinal origin.

Distention.—In general peritonitis the bowel is greatly inflated from paralysis of peristalsis, and immobile as a whole. In strangulation and volvulus the involved portion of the bowel alone is inflated at first, and its mesentery being fixed mechanically at the point of constriction, this portion is free from peristaltic movement. The efferent or leading-off portion is contracted, while the afferent or leading-to portion, in case of strangulation low down, fills up slowly. In strangulation high up the afferent portion becomes more rapidly distended. In cases of obstruction by plugging the distention gradually decreases in volume as we approach the stomach. In addition to this there is not such pronounced diffused interference with peristalsis, the different intestinal coils filling and emptying themselves repeatedly.

Sixty-eight per cent. of all cases of strangulation give a previous history of peritonitis, and in 12 per cent. there have occurred some form of intestinal disturbances attributable to interference with the function of the tube, if, indeed, they are not made out to be real attacks of obstruction, more or less complete.

Symptoms pointing to inflammatory processes in the region of the gall-bladder and duodenum may sometimes be obtained as a part of the history in cases of obstruction from impacted gall-stone. Preceding biliary colic and icterus are only valuable as suggesting the formation of calculi. Gall-stones sufficiently large to cause obstruction usually pass directly into the bowel from the gall-bladder by perforation.

The after-course of the case following the entrance of the gall-stone into the intestine can but rarely furnish information bearing upon the occurrence or seat of its arrest.

Early vomiting and prostration are the significant features of an obstructive lesion in the small intestine, while tenesmus and bloody stools are the striking characteristics of that of the larger intestine.

The possibility of a diaphragmatic hernia—with its history of an injury, distended and tympanitic area upon one-half of the thorax, restricted respiratory movements, feeble breath-sounds, and diminished vocal fremitus and vocal resonance—occurring coincidently with symptoms of intestinal obstruction, should not be overlooked.

Fæcal obstruction usually furnishes a history of subacute onset and chronic course. The insidiousness of its development may throw the practitioner off his guard. Its recognition depends mainly upon the demonstrated presence of a tumor with irregular surfaces lying in the course of the intestine. It occurs more frequently in the large than in the small intestine, and above the ileo-cæcal valve or sigmoid flexure.

Finally, the possibility of the occurrence of intestinal obstruction from more than one cause should be borne in mind. Thus, the starting-point of a fæcal obstruction may be a cicatricial contraction from an old ulceration, and a stricture originating in malignant disease may not have encroached sufficiently upon the lumen of the gut to give rise to obstructive symptoms until it serves to arrest the passage of a large gall-stone. The latter occurred in a case operated upon by myself.

In general terms it may be stated that the more violent the onset, the more severe and persistent the pain, and the more profound the collapse, the greater are the probabilities that either strangulation or volvulus is present.

So far as the success or failure to differentiate between the conditions causing the obstruction and its bearing upon the indications for operation is concerned, it may be said that such differentiation is frequently impossible and always unnecessary. In all cases the diagnosis can be made by exploratory abdominal section, and this course is imperatively demanded, both from the diagnostic and therapeutic standpoint.

Prognosis.—In obstruction from causes residing within the gut, such as foreign bodies, gall-stones, fæcal impaction, etc., as well as occlusion of the gut from tumor-pressure and the presence of the products of inflammation, the prognosis is more favorable than when the obstruction is due to strangulation from bands, angulation, or rotation. The mortality in all forms, however, unless operated upon early, is high. Operative interference is not usually undertaken until the patient's strength is exhausted or general peritonitis has supervened, with the result that an undeserved opprobium is cast upon the surgeon's work. The following experience is illustrative of this:

Lobstein[1] collected 60 cases of obstruction due to gall-stones not operated upon. Of these 29 died unrelieved, the gall-stone passing

[1] *Beiträge zur klin. Chirurgie*, Bd. iii. Th. 2.

on and the patients finally recovering in the remaining 31. On the other hand, out of 31 cases turned over to the surgeon for operation 19 died. From Lobstein's statement of the condition of these patients when they came into the surgeon's hands, it is apparent that they belonged with the necessarily fatal cases without interference of the first collection. On the other hand, the fact that they recovered is evidence that the 31 favorable cases, in which the gall-stone was finally passed, were cases of incomplete rather than of complete obstruction. Further, the results obtained in the second collection, viz. 12 out of 31 cases, are to be considered as extraordinarily favorable, since, between pre-existing septic inflammatory conditions, prostration, and the existence of complete obstruction, the majority were beyond hope when the operative procedure was instituted.

The occurrence of strangulation is the important feature in acute cases, the fate of the bowel itself being of far greater importance than the mere occurrence of obstruction to the passage of faecal matter.

L. Rehn[1] obtained 10 recoveries out of 13 cases of acute intestinal obstruction by early operation. Of these the majority were cases of strangulation and torsion. One was a case of flexion due to the presence of a suppurative collection, the symptoms disappearing after evacuation of the pus. One was a case of displacement of the sigmoid flexure due to the presence of the fœtal sac in a case of abdominal pregnancy.

All cases of hyperacute intestinal obstruction, *i. e.* those involving interference with the function of the bowel itself and causing nutritive and destructive changes in its walls, invariably prove fatal without operation. The prognosis in operated cases will largely depend upon the promptness with which the abdomen is opened and the bowel released from its dangerous environment, the damage inflicted upon the intestine and mesentery, and the effects of this upon the system at large.

Treatment.

Abdominal Section for Intestinal Obstruction.—Inasmuch as the incision must be largely of an explorative character in acute obstruction, for the reason that it will rarely occur that a positive anatomical diagnosis will have been made with sufficient certainty to warrant the surgeon in making his incision directly over the supposed site of the obstruction, this is usually made in the median line, and extends from the umbilicus above to the ensiform process, or below to the pubis. The incision is made generally by preference through the linea alba, although this is not always distinct below the umbilicus; it may pass through either one or the other recti muscles. By some this latter is considered an advantage, the muscular cicatrix giving rise

[1] *Archiv für klin. Chirurgie,* Bd. xliii. Th. 3, 4.

to less liability of ventral hernia. Great care must be exercised as the peritoneum is reached, if there be much distention. This structure must be held well away from the abdominal contents by a pair of mouse-tooth forceps while a small opening is made. This is enlarged without releasing the peritoneum until the index finger of the left hand can be introduced. The further enlargement of the opening can now be done by means of the blunt scissors or knife, using the finger as a guide and exercising great care that neither the omentum or intestine above nor the bladder below are wounded. One or two vessels may require clamping for a short time; these do not, as a rule, require ligature.

If it becomes necessary to prolong the incision during the operation this may be done by means of the curved scissors. In carrying it above the umbilicus the incision should be curved around the latter on the left side in order to avoid the suspensory ligament of the liver.

As soon as the cavity of the peritoneum is opened, hot bottles or gauze compresses should be at hand for covering the distended coils of intestine and supporting these as they tend to escape externally. The sigmoid flexure and the ileo-cæcal region are first subjected to an inquiry as to the existence of a twist at the site of the former, or intussusception, gall-stone obstruction, or neoplasm at the site of the latter. The next object must be to search for collapsed small intestine, which may be generally found by following the distended coils in the direction in which the distention increases, this leading to the point of obstruction. Finally, collapsed gut will be found, and when this has once been identified it is but a question of short search between the distended coil above and the flattened intestine below before the place of obstruction is identified. The character of the obstructing agent is now determined and measures taken to release the involved intestine if the obstruction be from without the gut; remove the offending substance if from within; resect the intestine if the obstruction resides in its walls, or if the latter have become gangrenous from prolonged constriction or torsion of the vessels of supply in the mesentery; connect together the portion below with that above the obstruction by means of either lateral or circular enterorrhaphy following resection, or, it being found impossible to resect the diseased parts, the application of intestinal anastomosis and elimination of the diseased portion by either lateral implantation of a portion of intestine from above into healthy intestine below the obstruction, following section at the former point, and closure of the diseased portion of the bowel, or flatwise approximation of two bowel-surfaces with communicating slits in such manner as to "short circuit" the intestine and carry the fæcal current around the point of obstruction.

Finally, under circumstances demanding that the operation be

brought to a termination as quickly as possible the operator may be compelled to resort to the formation of an artificial anus for the purpose of temporarily relieving the patient, leaving it for the future to decide the best method, if any, of relieving the patient from his unfortunate environment. Under circumstances of excessive distention these manipulations will often be seriously embarrassed, and will be found necessary to empty the coils either by aspiration or incision.

When general peritonitis is present this must be treated upon the lines laid down in the chapter devoted to that disease. In the absence of this complication, and if infection has been avoided during the operation, the abdomen may be closed at once. If fæcal extravasation has occurred, the parts contaminated must be cleansed as rapidly as possible by wiping out with gauze. The question of flushing the abdominal cavity is still *sub judice*. If resorted to, a six-tenths of 1 per cent. solution of chloride of sodium in sterilized water is to be employed. A teaspoonful of common salt to the quart will be sufficiently accurate when the solution must be improvised.

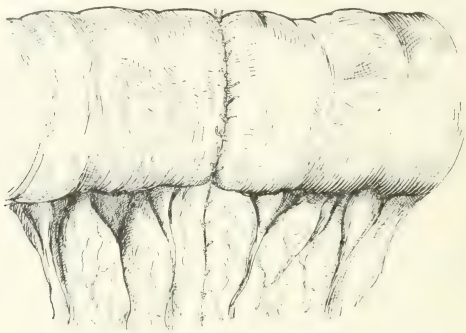
Resection of the Intestine.—The diseased portion of the bowel must be completely excised, together with a V-shaped piece of the mesentery, and the latter tied in sections. The adjacent portions of bowel must be emptied and cleansed as soon as divided. The further escape of fæcal matter into the field of operation must be guarded against, either by the application of a suitable clamp, by passing a narrow strip of gauze through the mesentery, *well away from the attachment of the latter to the bowel*, lest some of the blood-supply to the latter be interfered with, and twisted to constrict the bowel slightly, or by the thumbs and fingers of an assistant making compression. The latter is always to be preferred when available.

The suture of the divided bowel should always begin at the mesentery, and it is here that the greatest care is necessary in order to secure against leakage. After this has been done the suturing is to be completed. The interrupted Lembert suture of silk should be employed. Continuous Lembert suturing is not to be used, for the reason that it has a tendency to produce a purse-string effect and cause constriction of the bowel at this point. When completed the parts should present the appearance shown in Fig. 30.

Since extravasation and general peritonitis is the most frequent cause of death after the operation, it is wise to leave a narrow strip of gauze in contact with the suture-line, and led out of the abdominal wound, to provide against the accidental giving way of a stitch; this is to be removed after forty-eight hours. As additional security Senn sutures a portion of the great omentum over the entire row of sutures in circular enterorrhaphy, thus completely encircling the suture-line by a detached omental graft an inch wide.

Lateral anastomosis after resection has no advantages over circular enterorrhaphy as just described. Even with the most rapid technique

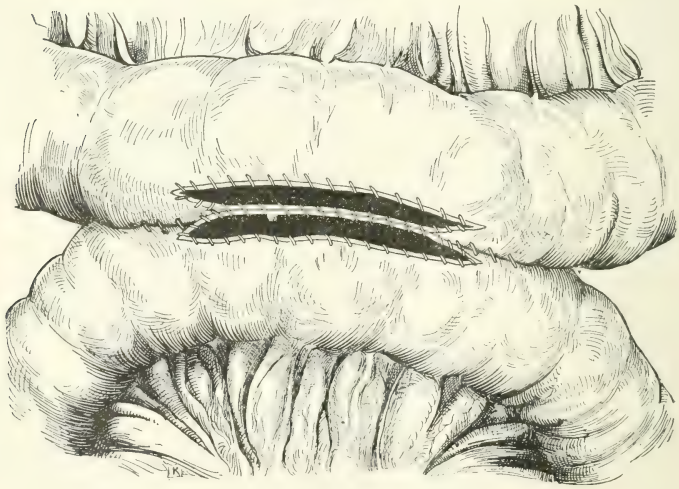
FIG. 30.



Appearance of the parts when completely sutured.

yet devised it will be necessary to close the divided ends of the bowel, which, if properly done, will probably consume quite as much time

FIG. 31.

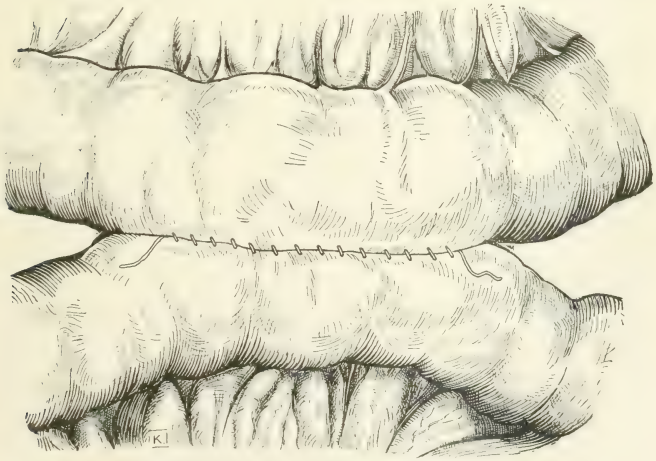


The first stage in intestinal anastomosis.

as that which has been saved by the application of the plates of bone after Senn, or the potato-plates of Dawbarn.

Intestinal Anastomosis.—This operation is designed to unite portions of the intestinal tract more or less distant from each other, without the necessity of resecting an intervening portion of the gut. It is a useful expedient in cases in which the patient's condition is such as to demand haste, as well as under circumstances of extensive disease where resection cannot be done. Its largest field of usefulness is in the small intestine, a coil as near as possible to the obstruction and above the latter being selected for the purpose, and applied to the coil immediately below. The slits of communication should be made diametrically opposite to the mesenteric attachments, and, to allow for subsequent contraction, which always occurs, the opening should be not less than two inches in length. The suturing should be done in two stages, the first consisting of uniting the edges farthest from the operator by a continuous stitch, as shown in Fig. 31. In cases demanding urgent haste the hemming of the cut edges, as shown in the drawing, may be omitted. The second stage consists of uniting the edges nearest to the operator by another continuous suture, and finally applying a second suture-line all the way around the approximation-line (Fig. 32).

FIG. 32.



The second or final stage in intestinal anastomosis.

The method of intestinal anastomosis by suture is far safer than by mechanical devices, but the time required is somewhat longer.

In all operative attacks upon the intestines the parts to be operated

upon must be brought outside of the abdominal cavity when possible, and the remainder of the viscera protected by warm towels or large gauze compresses during the manipulation.

In closing the abdominal wound following this, as well as all operations involving the cavity of the peritoneum through the anterior abdominal wall, it is essential that the parts should be properly approximated, and primary union obtained, in order to avoid the subsequent development of surgical hernia.

DISEASES OF THE RECTUM AND ANUS.

By JOSEPH M. MATHEWS, M. D.

It is the purpose of the writer to try and deal with the subject of Diseases of the Rectum and Anus in a practical way. In the last decade much has been written concerning the treatment of these diseases, and it cannot be gainsaid that the necessity exists. Surgeons of much repute have been giving special study to the subject, and no work on surgery or medicine is now considered complete that does not give consideration to this most important class of diseases. Recognizing the fact that from time immemorial, patients suffering from rectal disease had but little offered them in the way of relief, save by the itinerant quack or charlatan, it is but meet and proper that the physician of to-day should be well posted in their treatment, especially in a palliative way. The time has passed when a *placebo*, such as ointments, powders, etc., can be presented satisfactorily to the patient suffering from any one of those numerous complaints which commonly affect the rectum and anus. He will either at once recognize the gross ignorance of the physician so doing, or after a trial hasten to some one in whom he has more confidence. No part of the anatomy has been so outrageously imposed upon by the pretender as have the rectum and anus. In times past the regular physician has seemed to intentionally neglect this class of patients, and therefore it is no wonder that they have fallen into the hands of the illiterate and pretentious quack.

Examination.—Disease in the rectum is oftentimes made manifest by decided symptoms that cannot be mistaken; at other times the manifestation may be so obscured or the disease so insidious as to make a diagnosis very difficult. To achieve success in the treatment of rectal diseases one must be able to differentiate between a score of affections which by the medium of reflex action simulate a diseased condition of the rectum. To jump at conclusions without a plausible process of reasoning would only result in grave error. It seems to be nearly universal for patients suffering from any diseased condition of the rectum to designate the same as "piles." Hence the physician often makes the mistake of prescribing for a disorder that the patient has diagnosticated, and that he is not really affected with. Therefore

it cannot be urged too strongly that in every case an examination of the parts should be made.

Much paraphernalia is not necessary in order to make a thorough examination of the rectum; indeed, in the majority of instances a speculum will be found superfluous. Before placing the patient upon the table for ocular inspection, etc., it will be found advantageous to ask some questions or to have him describe his symptoms. The following might be suggested: The age of the patient. How long affected. The amount of pain; character of pain; whether it is connected with act of defæcation or not. What the character of fæces: whether moulded or not; whether bowels are constipated or loose. State if blood, mucus, or pus is found in stools: if blood, whether light or dark. Whether bowel protrudes at stool: if so, does it replace itself, or does patient put it back? What is the condition of the kidneys? do they act too often or not often enough? State the amount of urine passed in twenty-four hours. Has the patient ever had syphilis? Is there a tubercular tendency in family? Has the patient ever had gonorrhœa? Has he ever been told that he had stricture of the urethra? If the patient is a female, ask whether married or single; if she has ever borne children; if any rupture of perineum, etc., took place; if any ovarian or uterine pain exists; if any discharge from the vagina, prolapse of womb, or difficulty of urinating. Ask concerning any special diathesis, such as rheumatic, neuralgic, etc. Note loss of flesh, especially so if rapid.

Any one or all of these questions may prove of service in properly diagnosticating a case. It must not be presumed, because a patient complains of rectal trouble, that in all cases the seat of disease is in the rectum. Very often the rectal symptom is but a cry from the real seat of disease through the medium of a nerve. The writer has had under treatment five cases where the patients came to him to be treated for rectal disease when in truth none existed, and the symptoms were traced to a displaced kidney. It is well known that a stricture in the urethra will often give the most pronounced pain, irritation, etc. in the rectum. An enlarged prostate is one of the most frequent causes of irritability, etc. in the rectal walls. A displaced womb may often set up symptoms which point to this part of the anatomy. It may be incumbent then to make a general examination of all contiguous organs before stating positively that the rectum is accountable for the symptoms presenting. In this connection it might be well to call attention to the fact that the coccyx is sometimes responsible for great disturbances in the rectum. It is well, therefore, to examine this little bone, and to inquire after any trauma that may have happened to it; and also not to forget that it may be the seat of disease outside of the trauma. A constitutional diathesis should

never be forgotten in making up the verdict of disease in the rectum or elsewhere. Whether a physician is prepared or not to operate in these diseases, his general knowledge should be such as to enable him to ferret out the real cause and seat of the disease. Presuming, then, that all proper questions have been asked, an examination should now be made; in other words, the physician should not take the patient's diagnosis, and prescribe without making an ocular inspection of the parts before prescribing. A flat, hard table, a rectal speculum, a pair of dressing forceps, are all that is needed for this examination.

Placing the patient on the table, in Sims' position (on left side), with a good natural light, first inspect the buttocks, anus, perineum, thighs, and scrotum for any abnormal condition. Much evidence may be obtained by this inspection. For instance, the following may be detected: External piles, fissures, condylomata, eczemas, external opening of fistulæ, discharges from the rectum, external growths, syphilitic erosions, gonorrhœa in women, etc. Next, anoint the fore finger and gradually introduce it into the anus. The following should be noted while this is being done, viz.: The condition of the sphincter muscle, whether close and rigid or loose and patulous; whether hypertrophied or thinned; whether resisting or non-resisting. With the finger in the rectum the following conditions can be diagnosticated: First of all, note the prostate gland if the patient is a male—whether enlarged, sensitive, indurated, or softened. In the female, the position of the womb—whether or not any displacement that may be responsible for any of the rectal symptoms. In obscure cases the examination of the uterus and its appendages should be made. In the virgin it is well to inquire after the menstrual flux—whether regular or irregular, painful, profuse or deficient in quantity. The bladder should not be neglected in searching for a cause of rectal disturbance: vesical irritation is a frequent factor in these cases. Stone in the bladder may often be found when least suspected, and prove a great source of reflex irritation to the rectum.

After making a thorough investigation of contiguous parts, the rectum can be further explored with the finger, the best of all methods, and the following conditions may be detected: Polypi, openings of internal fistulæ, strictures, ulcerations, cancer, internal piles (when *indurated*), abscess, foreign bodies, etc. Ordinary internal hæmorrhoids that have not undergone atrophic change or the inflammatory process cannot be detected with the finger.

The Speculum.—In the vast majority of rectal cases it is not necessary to make an examination with the speculum; it is generally a painful procedure and reveals but little. The person who is *au fait* in making such examinations can more readily make a diagnosis with the finger than by any other means. The speculum should only be

used after the finger has failed to detect the trouble or the clinical facts in the case demand its use—such as obscure hæmorrhage, pain, or a discharge of pus, mucus, or a combination of the two. Perhaps the openings of internal fistulæ can be diagnosticated by sight through a speculum, especially if the discharge can be seen. Internal hæmorrhoids will fall between the blades of the speculum, of course, but a much better impression can be gained by having them protruded by the patient.

The Probe.—The probe is of but little utility in any rectal disease except perhaps fistula in ano, and is overestimated in this affection. It can just as well be told that fistula exists, if a sinus can be *felt*, or an opening *seen*, as to explore with a probe. It makes very little difference under which head—internal, external, or complete—the fistula may be designated, as each must receive the same treatment.

Sounds.—Many varieties of sounds are used for the purpose of diagnosticating rectal affections, especially when the disease is located high up the rectum. The advantages of such are purely chimerical, and the disadvantages very apparent. *Imaginary* strictures are often found, because of the catching of the sound in the folds of the gut, or perhaps by meeting with a natural obstruction, such as the promontory of the sacrum, the uterus in the female, or an enlarged prostate in the male. Besides, a sound may prove to be the source of great danger. If of metal or hard rubber it may be pushed into the peritoneal cavity, especially if a pathological condition exists, as cancer, ulceration, etc. If any instrument of the kind is to be used it is much better that a soft-rubber one, such as Wale's rectal bougie, be kept on hand for this purpose. It is twelve or fourteen inches long, and by injecting water through it the whole length of the rectum can be explored without danger.

To sum up, it can be truly said that 80 per cent. of rectal disorders can be diagnosticated by the use of the finger, and the remaining 20 per cent. by taking the clinical history of the case, and by the use of the speculum, and that it is seldom necessary to use either probe or sound.

Preparation of Patient for Operation. — The modern surgeon realizes that the terms minor and major surgical operations are ill defined. The chief risk in all wounds is from sepsis, and the microorganism can enter through a small wound as well as through a large one. Many of the operations around the rectum might under said classification be called minor, when in truth, if every safeguard is not thrown around the patient, infection may speedily take place and the termination be a fatal one. The writer recalls one death from tetanus, following the ligation of hæmorrhoids. Therefore all operations

around the rectum should be done under strict antiseptic precautions. The rectum, as is well known, is abundantly supplied with lymphatics, and its blood-supply is enormous. The pathogenic germ finds here a ready entrance into the system. At best, this portion of the gut is difficult of perfect asepsis; hence the greater should be the effort of the surgeon. Whatever may be the differences among surgeons as to the necessity of employing agents to produce an antiseptic condition (chemicals) or simply procuring an aseptic field, certain it is that the antiseptic method is to be preferred in rectal work.

In preparing a patient for an operation in this line there are a number of things to be looked after: First, the habits of the patient should be known. For instance, in operating for hæmorrhoids in the drinking man it is of much importance to look after the liver for several days before operating. The portal circulation in such a patient is greatly interfered with. It is well to order in a case like this a good dose of calomel for two or three consecutive days, and then a thorough passage with a saline. It should be understood that perfect abstinence from drink should be observed for a number of days before the operation. Before operating for any rectal disease (especially an obscure one), affections of contiguous organs should be carefully noted, else a confused prognosis will likely be made.

Having determined that the case is a suitable one for operation, the following plan will be found a serviceable one: A free purge should be given the day before the operation. The next morning the rectum should be washed out with a large enema of hot carbolized water; the patient is then given a bath, the parts are shaved, and he is ready for the surgeon. When under the effect of the anæsthetic the whole field of operation should be scrubbed with soap, and then washed with a bichloride solution. The sphincter muscle is now divulsed and the rectum thoroughly irrigated with bichloride solution 1 : 5000. Then the operation is proceeded with.

It seems to be the impression with some that whatever may be the necessity for strict antiseptic measures in surgical work, the rectum is to be neglected in this particular. It is very true that because of its peculiar office it is difficult to procure a perfectly aseptic condition of the parts; but it would be a grave mistake to neglect every effort to accomplish this result. As has been stated, the rectum is the seat of an abundant blood-supply and lymphatic distribution which readily invites sepsis. Every rule laid down for antiseptic surgery should be carefully followed when doing these operations. Quite a number of cases of tetanus are reported as following rectal operations, and it can be readily understood that general sepsis could obtain. After a complete bath of the body the local field should be scrubbed with soap and water, and irrigated with the bichloride solution. Then with a

good speculum the sphincter muscle should be widely dilated and the irrigating process extended to the rectum for a number of minutes. All wounds that are made in doing the operation should be dressed with iodoform or bichloride gauze, and the instruments of course sterilized before the operation. Dressings should not be allowed to remain on long enough to become septic, but removed as early as the exigencies of the case demand. It is true that the dry dressing plan is to be preferred in all surgery around the rectum, but the interval between the changing of dressings must be in accordance with antiseptic rules. With each change thorough irrigation of the parts must be practised. The surgeon neglecting such precautions must expect to have the same bad results as would obtain in doing any other surgical operation. It is not the purpose of the writer to name any special agents to accomplish good results, but simply to advise that antiseptic precautions be taken in every case.

HÆMORRHOIDS.

It is a singular fact that a majority of patients suffering from rectal or anal trouble will designate it as "piles." It is more singular that many physicians will take the diagnosis of the patient and prescribe some local application, without once making an examination of the parts. The same physician would not think of taking the patient's opinion concerning disease in other portions of the body, therefore why trust to his diagnostic power when the malady attacks the rectum? Patients often imagine that a very slight trouble in this part of his body is of the gravest sort, and it is often a difficult matter to satisfy his mind that a fissure of the anus, or the presence of a small hæmorrhoid, is not a cancer of the rectum. *Per contra*, very formidable disease here is treated by the patient as a very simple affair. It is, then, a matter of great importance to examine each case—by ocular inspection at least, and generally by the aid of instruments. It is a question with some as to which one of the rectal affections predominates. If the patient's opinion is to be taken into consideration the question could be quickly settled in favor of "piles," for this is nearly the unanimous verdict. If the doctor's who prescribes indiscriminately for these affections the same local remedy, the same verdict could be had.

In speaking of this subject, Mr. Allingham in his most excellent work says: "Fistula is, at all events in hospital practice, the most common rectal disease affecting the adult. Out of 4000 cases taken consecutively and without selection, at St. Mark's Hospital, from the

out-patient department, there were 1057 persons suffering from fistula, and 196 from abscess, of which 151 subsequently became fistulæ, so that more than one-fourth of the cases treated were fistula." This has not been the experience of the writer, but instead, hæmorrhoids has predominated in his practice as a rectal affection. In making this statement it is intended to include all varieties of hæmorrhoids, both external and internal. It has been argued by some writers that climate plays a part in the production of the hæmorrhoidal condition, and that habits incident to certain nations as well as individuals do also. As to the former statement, it might seem plausible that in the hot climate this affection would be oftenest found, but the experience of the writer does not bear out the assertion. As to national habits, especially the drinking one, it might be asserted that England cannot boast of any special abstinence over the States. Again, it must be remembered that fistula may be only a complication of some other trouble, and not only secondary but caused by it. It is a familiar fact that stricture of the rectum often is the originating cause of fistula, and in making up statistics of such a case it should be put down as a case of stricture, and not of hæmorrhoids. Therefore, after an observation of several thousands of both affections, the writer is constrained to believe that hæmorrhoids predominates as a rectal affection, at least in United States.

For convenience of description as well as treatment, a division will be made between external and internal hæmorrhoids. It is sufficient for the patient to know that he has a case of piles, but the physician must draw the distinction between them in order to give the case rational treatment. Indeed the same methods will not obtain in both. To illustrate: a patient suffering from an enlarged and inflamed external pile is always making a strenuous effort to push it into the rectum, when its place is outside the sphincter muscle, and any handling for the purpose of "reducing" it adds to the patient's discomfort.

External Hæmorrhoids.

External hæmorrhoids are generally described under two varieties, viz. *venous* and *cutaneous*. The term *thrombotic* would be more appropriate in describing the first variety, for it is really a *blood-clot*. It has been discussed by some writers whether the clot coagulates in the vein proper or in the tissues. This matters very little as far as the treatment goes. The seat of both varieties is at the verge of the anus, and they cause about the same amount of disturbance. Some have applied the term "blind piles" to the external variety in contradistinction to the "bleeding" variety of internal piles. To say the least of the term, it is unsurgical and signifies nothing. The symptom of bleeding is always of much significance to the patient, and the one

that first causes him to seek advice from the physician. Whenever bleeding occurs it is safe to affirm that it is from an internal pile. External piles do not bleed, although there is a "mixed" variety which is partly external and partly internal, found just at the verge of the anus, from which blood will escape from the internal portion. This small tumor is covered by true skin externally, but has mucous membrane lining the upper portion. By taking hold of the lower part of the tumor and drawing it downward and outward the inner portion will be exposed.

Symptoms.—The symptoms of external piles generally come on suddenly, the patient likely feeling no discomfort in the morning, but before night being aware of decided trouble. Pain is the most prominent symptom, and the patient seeking for a cause finds this tumor at the verge of the anus. Not knowing of the varieties of piles, and imagining that this tumor belongs inside the rectum, he immediately begins an effort to push it inside, thereby adding to his distress. The pain arising from the venous or thrombotic pile is caused by tension; that from the enlarged tag of skin, from the inflammatory process. Itching often accompanies an attack of external piles, and proves to be distressing. If the patient does not quit work, his condition grows worse because of the exercise and irritation of the parts. His habits, too, have much to do with the aggravation of his symptoms.

Causes.—It is often a difficult matter to trace the cause of an attack of external piles. Many persons have a superfluous amount of skin, or tags of skin, around the anus. This condition, of course, could be easily excited to the inflammatory process by irritation, filth, etc. It would also be set up by a teasing diarrhœa or dysentery. The use of rough or printed paper, or other coarse articles as detergents could excite to the same condition. The thrombotic pile is oftenest caused by straining at stool, as for instance in the constipated habit, though many persons who have this habit never suffer from piles. It can be understood, too, that a diarrhœa or dysentery could produce that straining effort which would rupture a vessel. Many persons, however, will report for treatment for external piles who have no such diseases and are of perfectly cleanly habit. It is believed by some that such habits as drinking or smoking act as a factor in producing external piles. Such habits are much more likely to produce internal piles. Certain it is that any local irritation of the parts from whatever cause will aid in producing an attack. Among these agents may well be mentioned the bicycle. The continued sitting upon the saddle incident to a long ride is a common cause of the trouble. The writer has operated upon one patient three times for external piles caused by riding the "wheel." Some authors

believe that pressure by a displaced uterus upon the rectum may cause external piles. An enlarged prostate or a stricture in the urethra may act as exciting causes to this affection.

Treatment.

The treatment of external piles should be to a great extent prophylactic. Even children should be taught the necessity of a daily evacuation of the bowels. Patients generally should be instructed to avoid the straining effort at stool, and the importance of leaving the seat as soon as the bowels are through acting. Very many persons, especially in the country, are in the habit of using common printed paper as a detergent. This should be strongly condemned. The mucous membrane everts when the bowels act, and nothing is more irritating to it than ink; indeed, it would be well to discard all paper from the water-closet and use instead cold water for the purpose of cleanliness. No paper can thoroughly cleanse the anus after the act of defæcation, but the water will. Besides, the source of irritation is gotten rid of. If, however, a patient presents himself with a case of external piles he should be properly cared for. There is more pain and discomfort attending an attack of the external variety than from an ordinary attack or the presence of internal piles.

An examination should be made of the parts to determine which variety of piles is to be dealt with. The rectum should also be investigated in order to find out if some other pathological condition does not exist which of itself may be the cause of the attack of piles. If it is an uncomplicated case, palliative measures alone may allay the attack. By "attack" is understood the inflammatory condition which is manifest in the tag of skin or the presence of a blood-clot in the tissues.

The bowels should be cleared with an aperient, such as a dose of salts, castor oil, or citrate of magnesium. No active exercise should be indulged in, and really it would be better for the patient to assume the recumbent position, but it is not often the case that you can induce him to do so "for so trivial a cause." Heavy eating, such as much meat and bread, and the use of wines or other liquors should be interdicted. The bowels should have a liquid movement each day, and after each stool cold water should be freely applied. In some few cases the use of hot water seems more soothing to the patient and should be preferred. It is seldom necessary to poultice the parts. The inflammatory process will subside under this plan of treatment in about one week or ten days. Ointments do but little good save to allay itching; the best for this purpose will be found one containing menthol, such as—

℞. Vaselini, ℥j (30.);
Menthol., gr. xl (2.6).—M.
Sig. Apply to the parts after washing.

If there is an abraded surface, the following will be found of service:

℞. Vaselini, ℥j (30.);
Hydr. chlor. mit., gr. xxx (2.);
Menthol., gr. xx (1.3).—M.
Sig. Apply.

If the mucous membrane is exposed, as usually will be the case in the combined piles, exciting to pain, this prescription is a good one:

℞. Vaselini, ℥j (30.);
Hydr. chlor. mit., gr. xx (1.3);
Cocain. hydrochlorat., gr. xij (0.78).—M.
Sig. Apply after bathing the parts.

Washes are sometimes used with benefit, and I know of none better than the fluid hydrastis, pure or diluted, or the fluid extract of pinus canadensis, used in the same manner. Such agents as sugar of lead, alum, or tannin can also be used for the same purpose.

It must be admitted, however, that all these agents simply allay the attack of inflammation, and after it has subsided the "tag" still remains, to be irritated on some future occasion by a similar cause. For a radical cure it is much better to cut off the tag or tags, or *excise* the little blood-tumor. Such a procedure gets rid not only of the exciting cause, but of the tumor itself, and all fear of another attack is dissipated. The plan of "letting out the clot," so commonly practised in the second variety of external piles, will be found far less serviceable than to excise the tumor. Even with the best of precautions it will be found that the patient is just as long recovering from the attack when the palliative plan is followed as he is if the tumor is removed after the manner suggested. Muriate of cocaine can be used successfully in these cases (by injection) if it is thought best not to use a general anæsthetic.

Internal Hæmorrhoids.

Varieties.—It is common for authors to divide internal hæmorrhoids into three varieties, viz. capillary, arterial, and venous. No such distinction can positively be made, because oftentimes all three varieties may be found in the same patient, or the blood-supply of a tumor be both arterial and venous. A much simpler classification would be into *external* and *internal* piles, the external piles being

those found external to the sphincter muscle, and the internal piles being those originating inside of the sphincter. It makes very little difference as far as the treatment is concerned whether a pile is of the venous or arterial sort. It is well to draw a distinction between bleeding and non-bleeding piles: those that do not bleed are not at all dangerous; and, again, hæmorrhage is of all symptoms the most important to the patient.

Capillary Hæmorrhoids.—The capillary pile is the most insignificant of all as far as size is concerned, but is the most dangerous of the three varieties. Excessive hæmorrhage may take place from this variety of hæmorrhoid. It is not infrequent that large quantities of blood are lost in this manner, and a few deaths have been reported from hæmorrhage arising from a capillary pile. Of course, in such a case an arterial branch is concerned, and from this a fatal hæmorrhage might occur. The writer has had a number of cases of violent hæmorrhage from internal piles, but in every instance it was from a small and not from a large tumor. This variety of hæmorrhoid is not larger than the end of the little finger, sometimes much less, and resembles a raspberry in appearance. In the main they are made up of capillary vessels, but some vessels that feed the growth are of good size. When subjected to ocular inspection they are granular in appearance, but as time advances the friction to which their surfaces are subjected does away with this rough or granular condition, and the mucous membrane extends over them. Therefore it is in the incipient stage especially that they are dangerous through hæmorrhage. Later on the areolar tissue becomes thickened, and by plastic deposit the disposition to bleed is checked.

Venous, Internal Hæmorrhoids.—The venous pile is supposed to be the largest in size. Oftentimes, especially in the feeble, relaxed subject, they get to be as large as a small orange. They prolapse easily at stool and are sometimes difficult to replace. They do not bleed unless ulcerated, and generally the only symptom complained of is inconvenience in "putting them back," or the patient complains of soiled linen from their presence. It is a mistake to suppose that the entire blood-supply in this variety is venous, as the name would imply, for they may also receive arterial distribution. However, the hæmorrhage from this variety of pile is generally venous and is not followed by any serious consequences, especially in the healthy subject. In some this bleeding is said to be advantageous.

Arterial Hæmorrhoids.—Strictly speaking the term "arterial hæmorrhoid" is a misnomer. No hæmorrhoid is exclusively made up of one set of vessels. The arterial blood-supply may predominate, as it undoubtedly does in the arterial variety of piles, but there is also a venous circulation, and it is in this class that great danger exists in

the injection with carbolic acid or any other agent capable of coagulating the blood. The arterial pile is made up of dilated blood-vessels, and connective tissue abounds in them. For this reason it is out of the question to suppose that they can be cured or eradicated by the "squeezing" process, as proposed by Manly and a few others.

Symptoms and Diagnosis.

It is quite an easy matter to diagnosticate *internal* piles, as such, but it would be a difficult matter often to say whether a tumor was of the arterial or venous variety. In the first place neither variety has hæmorrhage for a symptom, and should blood escape no differentiating between the two could be done, inasmuch as either venous or arterial blood could issue from either class. It is much easier to diagnosticate a capillary pile than to draw a distinction between the arterial and venous kind. Hæmorrhage is the chief symptom complained of, and all symptoms of the two other varieties are absent. For instance, a patient states that while at stool a copious hæmorrhage took place, which was perhaps repeated each succeeding day; that the blood was of bright color, and came in spurts; that no protrusion of the bowel occurred, that a feeling of dizziness succeeded the loss of blood; that pallor of countenance followed; and that pain was not a factor in the case.

It will be observed that all of the prominent symptoms of the large variety of piles are absent, viz. protrusion, which requires the replacing of the tumors; pain, which is often caused by friction; and the other symptoms which have been mentioned as characteristic of the arterial and venous variety. When such symptoms are present, an examination of the rectum should be made with the speculum. The tumor may be so small, soft, and velvety as to elude detection by the finger, and it should also be remembered that this form of pile may be located at a little distance up the bowel, at least higher up than either of the other two varieties. With a good light, and a speculum that will dilate the sphincter muscle well, this little tumor can be easily found. Generally the force used to open the bowel will open up afresh the bleeding vessel, and the blood can be seen to spurt or bubble up at the site of the tumor.

To diagnosticate the other two varieties of internal hæmorrhoids an entirely different method should be practised. When hæmorrhage is a prominent symptom, and occurs in any great quantity, it can be safely said that it is not from either the arterial or venous variety, certainly not from a large or well-formed tumor, for in such we find cell-growth and abundant connective tissue, the result of plastic infiltration. This checks the avenues of hæmorrhage, and it could only occur as the result of trauma or some force equal to the break-

ing of an artery. That this sometimes occurs cannot be disputed, but is not the rule. The capillary pile is a soft, spongy, or granular mass, which yields easily to slight force, hence bleeding *is* the rule. It can be said, then, that great danger can lurk behind capillary piles—in hæmorrhage—and that from the large, well-formed pile there is but little danger to be apprehended. When it is suspected that internal piles exist other than the capillary kind, it should be asked whether protrusion of the mass takes place at stool. If no such history is given it can be safely said that if hæmorrhoids exist, they are not of much size. It must be remembered in this connection that the patient's diagnosis or opinion must not be taken, as he will invariably call any disturbance around these parts hæmorrhoids.

Although the fore finger is the best agent that we can employ for examination of the rectum, it absolutely fails as an aid to making a diagnosis of internal piles. Even pile-tumors of good size cannot be detected with the finger after they are returned within the rectum. There is but one exception to this, and that is when the tumors have undergone the atrophic condition, are sessile, or pedunculated. The reliable way is to have the patient retire to the water-closet and "strain" the mass out, so as to be *seen*. If he should fail in this, dilate the sphincter with the speculum, and the tumors will be seen to fall between the blades.

The symptoms of internal piles are not well marked and certainly are not characteristic of the disease. Pain in the thighs, back, and loins; a frequent desire to pass water; general lassitude, etc. may be complained of, but these symptoms may exist from many other causes. It is better to look after the symptoms referred by the patient directly to the anus or rectum, and by an examination determine if there is any pathological change.

It is very common to ascribe constipation as a cause, or more properly speaking the chief cause, of internal piles. This belief cannot be borne out by fact. It can safely be said that the majority of people who suffer from piles are not of the constipated habit. It may exist, and of course sometimes does, but it is rather a coincidence than a cause of piles. That there is a hereditary predisposition to the hæmorrhoidal condition is pretty certain. It will often be found that whole families are given to the trouble. Patients often cite the fact that their parents, if not their grandparents, were the subjects of piles. Of course it must not be overlooked that the child-bearing woman is often the subject of internal hæmorrhoids. In these cases the tumors will be found just at the verge of the anus, and oftentimes in a prolapsed state. Children very seldom are afflicted with internal piles, though some such cases have been reported. In extreme old age piles are not often found, although they may have

existed in former life—they undergo atrophic change and, in common parlance, "dry up."

Uncomplicated internal hæmorrhoids cause very little disturbance, but when the seat of inflammation or ulceration cause great pain and distress. Such an outbreak is designated by the patient an "attack" of piles. This term can be used in regard to both external and internal piles. The tumors may remain quiescent for a long period of time, and seemingly without cause will become inflamed, and many distressing symptoms result. Patients will often use an expression like this, "I have often had piles before, but I was cured by some simple remedy, and have not had them for a long time"—when in truth he has had them ever since the first attack, but when the inflammatory symptoms subsided he considered himself cured. Although generally the patient cannot trace the cause of his "attack," it may sometimes be found as the result of a diarrhœa, flux, exposure to cold, bicycle or horseback riding, excessive venery, rough handling of the parts, the want of cleanliness, the use of alcoholic stimulants, and sometimes excessive smoking.

There is a "mixed" variety of pile which is not discussed by the authors, save by the author in his book on *Diseases of the Rectum*. It consists of both true skin and mucous membrane. The external part appears as a long tag of skin, and when pulled on a portion of the mucous membrane is everted, which is much thickened and highly congested. In operating for this variety of pile it is necessary to ligate after making the incision around the base, as in the event this was not done violent hæmorrhage could ensue.

In making the diagnosis of internal hæmorrhoids, all contiguous organs should be examined, in order to determine whether they play a part in the production of the rectal disease. An enlarged prostate, or a stricture of the urethra, may cause excessive straining, which would aid in the production of piles; a displaced womb or an irritated ovary might be a factor; stone in the bladder, a diseased kidney, hernia, varicocele, etc. might exist and result in decided reflexes, and aid in producing an attack of piles or other rectal symptoms. A proctitis which antedates the hæmorrhoids may be the cause of the inflammatory attack, or a colitis of long standing may be the exciting cause. In looking to a cure of internal piles, especially by palliative measures, every one of the above-named conditions must be sought for and eliminated, or corrected. The physician who expects to be successful in the cure of disease in any local portion of the body must be familiar with disease in a general way, or he will be making all manner of mistakes. It is the painstaking diagnostician that is the successful practitioner of medicine.

Palliative Treatment of Internal Hæmorrhoids.

The same thing that was said in regard to the treatment of external piles will obtain in the treatment of internal piles, viz. it must be highly prophylactic. The habits must be looked after, the secretions corrected, and symptoms which have a tendency to produce the hæmorrhoidal state should be treated. It is well recognized that the free use of spices and condiments—mustard, pepper, pepper-sauce—such things as the epicure is fond of, is productive of hæmorrhoids and other forms of rectal trouble. If, then, a patient is concerned about the hæmorrhoidal condition, or indeed other rectal trouble, it would be well for the physician to interdict the use of all such articles. There can be no question that the person who uses alcoholic or malt liquors to excess is more liable to hæmorrhoids than those who abstain from such drinks. The portal circulation is interfered with by such habits, and as long as they are indulged in but little could be done by the physician to effect a cure; or, granting that the patient is willing to abstain, it is well before beginning any special treatment for hæmorrhoids to look after the liver. Certainly before operating upon a patient given to the drinking habit, mercurials should be given for a number of days in succession, followed, of course, by aperients or laxatives. This class of patients are also given to over-eating. The appetite is really a morbid one stimulated by drink, and the overcrowding of the stomach is productive of grave results. The diet of the patient should therefore be looked after.

The class of patients who suffer from hæmorrhoids will sometimes be found of the constipated habit. If so, it will prove to be a most formidable complication and difficult to overcome. Such people should be advised to become water-drinkers—drinking as much as half a gallon per day, at intervals. For such, fruit should be freely prescribed—oranges, apples, figs, prunes, etc. Quite a good suggestion is to have the patient take prune-juice once a day, prepared in the following manner: Make a small bag of linen or cotton cloth, and put into it a handful of senna leaves. Place the bag with the prunes and boil for a sufficient length of time. When done strain the juice, and drink a small quantity once or twice a day. It will have a nice effect over the constipated habit.

Very often these patients will be of a morose or melancholy disposition and take very little exercise. Nothing is more conducive to good health than exercise; and, of all methods, walking is the best. The patient should be advised to take regular walks, especially in the early morning and late in the evening.

But we are to suppose that the patient presenting is suffering from an actual condition of hæmorrhoids: what advice or treatment is to

be afforded? Under such circumstances it of course must be determined what character of hæmorrhoids the patient is suffering from. If hæmorrhage is the symptom, and no history of protrusion is given, it would of course be presumed to be a case of capillary piles. These are seldom accompanied by pain, and it is the sight of blood that has driven the patient to consult the physician; or it may be the drain upon the system occasioned by the frequent hæmorrhages. This condition will often be witnessed in the female, who, from the loss of blood by menstruation together with the same from piles, suffers to such an extent as to produce profound anæmia. The main thing in such a case is to stop the hæmorrhage. To do so will be found a more difficult matter than is generally supposed. Ordinary astringents, those that are usually prescribed in such cases, have but little action for good. Reference is made to alum, tannin, borax, and others of this class. Besides, such procrastination might end in serious results. If the bleeding is pronounced, it is best to resort to something more effectual at once. The following plan may accomplish the purpose: With a speculum divulse the rectum freely, irrigate with hot water, watch for the bleeding-spot, and touch it with a drop of pure nitric acid from the point of a glass rod. Carbolic acid is commended by some for the same purpose, but is less effectual than nitric acid. The point of the actual cautery (Paquelin) will subserve the same purpose and is often to be preferred to both. If it is deemed inexpedient to use either of the above plans, recourse must be had to the prescriptions. The following are those commonly used:

℞. Tannin, ʒj (4.0);
Cocaine, gr. iij (0.15);
Cocoa butter, q. s.
M. et ft. suppositoria xij.
Sig. Insert one morning and night.

Or,

℞. Ferri subsulphatis, gr. xij (0.8);
Cocaine, gr. viij (0.5);
Vaseline, ℥j (30.0).—M.
Sig. Apply to the protruded parts.

Or the ferri subsulphatis can be used in a suppository, and it will be found to be of much greater efficacy than tannin.

If the hæmorrhage should not yield to the ordinary means, the following plan will be found to be a most excellent one in arresting hæmorrhage from internal piles, especially of the capillary variety: Have the rectum well washed out with hot water; dilate with a speculum, and place in the rectum over the bleeding surface of the piles

a small pad of gauze which has been freely moistened with Monsell's solution diluted with an equal part of water; withdraw the speculum and allow the pad to remain in for forty-eight hours. In the vast majority of instances it will be found that this procedure will effectually stop all bleeding. Mr. Allingham recommends the injection into the bowel of hamamelis twice a day in these cases.

When the "palliative treatment" of piles is spoken of, reference is made to the incipient stage of the disease, for after a well-defined pathological change has taken place, which constitutes the tumor of the arterial or venous pile, no palliative treatment will effect a cure. If hæmorrhage should be a prominent symptom in even these two last-named varieties, the same plan or plans of treatment as recommended for the capillary variety can be practised with success. In all such cases, however, an operation will be found necessary to effect a cure. Nothing less amounts to anything but temporizing or palliation.

Operative or Radical Treatment.

After an operation is decided on, there are many plans or methods suggested, viz.:

1. Excision.
2. Ligature.
3. Clamp and cautery.
4. Dilatation of the sphincter muscles.
5. Galvanic cautery wire.
6. The use of acids and pastes.
7. The injection of carbolic acid, etc.
8. Whitehead's operation.

Several more plans might be named, but this list is quite sufficient to select from.

1. **Excision.**—It cannot be denied that the first-mentioned plan, excision, would be an ideal one if left to the expert to perform. Reference is not made here to the plan of excision as practised by Mr. Whitehead, but to the simple excision of the tumor itself. For the reason that it is tedious and accompanied by a good deal of hæmorrhage, it is not often performed.

2. **Ligature.**—It cannot be gainsaid that the consensus of opinion is in favor of the operation by ligature for internal piles. It is the easiest of execution, the freest from danger, and the most radical in its results of all methods. It is the plan so highly recommended by Mr. Allingham and his confrères at St. Mark's, and it is the plan most frequently practised by American surgeons.

3. **Clamp and Cautery.**—There are some surgeons in Europe and a few in this country who prefer the clamp and cautery plan in ope-

rating for hæmorrhoids. The writer has employed it a number of times, but is forced to say that in his opinion it is not comparable to the ligature. The fact alone that bleeding might occur from the cauterized wound, which could not occur after a pile is ligated, is enough to condemn it. Mr. Allingham thus disposes of this plan of treatment: "This operation has little to recommend it. As regards danger to life—after all, the issue of the greatest moment—as far as our most careful researches have led us to a conclusion, it is quite six times as fatal as the ligature properly and dexterously applied."

4. **Dilatation of the Sphincter Muscles.**—Upon a false premise as to the pathological change which goes to make up the hæmorrhoidal condition, the French have advised the dilatation of the sphincter muscles as a means of cure for piles. It is not reasonable to suppose that a tumor made up almost entirely of hypertrophic vessels, a stroma of cell-growth, and abundant connective tissue could be dissipated by divulsing the muscle.

5. **Galvanic Cautery Wire.**—There was a time when the galvanic cautery wire plan of treating internal piles was much favored. It has fallen, however, into disuse and is supplanted by other and better plans.

6. **The Use of Acids and Pastes.**—Attention has been called to the fact that in bleeding capillary piles it is quite a good plan to apply fuming nitric acid to the granular surface of the pile. If this method had been limited to this class of patients, it would have proved to be of much service; but its application was extended to larger growths, and much damage resulted. It is very seldom used, and is limited to the kind of case indicated above. Pastes are of but little service and often do harm.

7. **The Injection of Carbolic Acid.**—So much has been written about this agent in the treatment of internal piles that the writer will not take the space to discuss it; sufficient to say that years ago he pointed out the dangers to be apprehended in its use. In referring to the writer's opinion Mr. Allingham says, in his most excellent book on *Diseases of the Rectum:* "For our own part, we agree with the opinion of Dr. Mathews. We have tried the injection plan in many cases, but there was generally much pain, more inflammation than was desirable, a lengthy treatment, and the result doubtful—*certainly not a radical cure.*" Dr. Edmund Andrews, a distinguished surgeon of Chicago, reports the following accidents which occurred out of 3304 cases collected: "Deaths, 13; embolism of liver, 8; sudden and dangerous prostration, 1; abscess of liver, 1; dangerous hæmorrhage, 10; permanent impotence, 1; stricture of the rectum, 2; violent pain, 83; carbolic acid poisoning, 1; severe inflammation, 10; sloughing and other accidents, 35." The writer desires to add

that in his practice he has seen a number of cases where stricture of the rectum resulted from this treatment, more than a score of abscesses and fistulæ, and other conditions equally bad. The consensus of opinion is that it is a dangerous and needless plan for treating hæmorrhoids.

8. **Whitehead's Operation.**—Several years ago Mr. Whitehead of England proposed a new operation for piles: it is, practically, to dissect out what he is pleased to call the whole "pile-bearing area." This necessitates the removal of about two inches of the lower rectum, then bringing down the gut and attaching it to the true skin. This operation has never found much favor with American surgeons. The following objections can be urged against it:

1. It cannot be advised except in selected cases.
2. An anæsthetic is necessary in every case.
3. Full and complete paralysis of the sphincter muscles is necessary to do the operation.
4. The operation is difficult, tedious, and bloody.
5. If union does not take place by first intention pus accumulates and invites sepsis.
6. The author recommends that the whole of the hæmorrhoidal plexus be excised, which is not necessary to effect a cure.
7. It can be maintained that secondary hæmorrhage is likely to occur after this operation, and the results given by the author do not justify his claims.
8. In a word, it is too much surgery when a simpler plan will result in a perfect cure.

It will be seen that the writer believes the ligature to be the best plan of treatment for internal piles. The special points to be observed during this operation are: Free divulsion of the sphincter muscle; thorough irrigation of the rectum, through a speculum, with a mercuric solution of 1:5000; dressing the tumor well down with volsella forceps; the ligature to be applied tightly at the base; the incision made in the true skin, and carried fully up the length of the tumor; and the hæmorrhoid cut off close to but at a safe distance from the ligature; antiseptic precautions before dressing, and antiseptic dressings after the operation.

FISTULA IN ANO.

As far as surgery goes, the treatment of Fistula in Ano is much more important than the treatment of hæmorrhoids. The disease, too, is of much more significance. Hæmorrhoids constitute a local

affection, but fistulæ in this region may be due to a constitutional cause. Hæmorrhoids very seldom affect the general health—except, perhaps, by bleeding, while fistula may so undermine the constitution as to seriously impair the natural vigor. All surgeons who have operated often for fistula are aware of the fact that it requires the most precise and delicate surgery to cure a complicated case of fistula in ano.

VARIETIES.—Almost all authors divide fistula in ano into the following varieties: *external*, *internal*, and *complete*—meaning by the external variety one that has an external but no internal opening; by the internal variety, one that has an internal but no external opening; and by complete, a fistula which has both an external and an internal opening. To the writer's mind this division is both misleading and inaccurate. By such classification no adequate knowledge can be had of the extent of the disease or of the amount of surgery which it will require to cure it. A patient may be present with a fistula which has the most insignificant external opening, and yet when the operation is performed it will be found that great destruction of tissue has taken place. A fistula may be *complete*, and be only a simple channel from the outside to the inside of the lower margin of the gut.

A much more significant division of fistulæ would be: *progressive*, *non-progressive*, and *complicated*. Such a one would at least signify some idea of the pathological changes that had taken place, and indicate to the surgeon what he might expect in the way of an operation. Not only this, but some idea could be gained as to the necessity for operation, and whether it was imperative or not. Many times patients consult a physician for rectal disease and it is ascertained by examination that it is a case of fistula, but—what kind of fistula? It may be that the patient can ill afford to have an operation done at the time of consultation, and it is the physician's duty to say whether procrastination can be practised. To say that it is an *external*, or *internal*, or *complete* fistula would signify but little, but if he saw from unmistakable evidences that the disease was rapidly progressing, that other parts were being invaded, and that local destruction was threatened, he would advise that an immediate operation be done. If, on the other hand, it was observed that the fistula was a small affair, and was *non-progressive*, he could safely say that the operation could be deferred. If it was *complicated*—for instance, if inroads had been made into other organs, such as the vagina, bladder, labia, penis, etc. —a better idea would be had as to what operation or operations should be done.

As has been intimated, fistula in ano may be a very simple affair or it may be a grave disease. It has been the misfortune of the writer to see a number of cases that were inoperable because of the

vast destruction of tissue, and invasion of contiguous organs. Some fistulæ in ano are so rapidly *progressive* that delay is fatal, in so far at least as all future comfort is concerned. The guide in estimating the progressive nature of the disease is the amount of pus discharged. It may be, too, that much of it is confined, and having no external exit makes inroads by burrowing to internal structures. If there is not much suppuration it is safe to conclude that the channels are lined by the so-called "pyogenic" membrane, which prevents invasion of other parts. It must be remembered that pus is not a secretion, but that its presence betokens danger. Sometimes the term fistula in ano is a misnomer, for very few fistulæ in this region relate to the anus at all; many of them communicate with the rectum, and some fistulæ in this neighborhood affect neither anus nor rectum. The buttock may be extensively invaded, the perineum destroyed, or a sinus run high up the back or to the thigh-joint, and have no connection with the rectum. Hence in such cases as these the instruction of the authors, "to push a director through the sinus until it is felt in the rectum, then pull the distal end out of the anus, and divide all the tissue thereon," will not obtain.

Great stress is laid upon the importance of finding the internal opening of a fistula, before operating: so far has this fallacy extended that surgeons have been known not to operate in a bad case of fistula, because "the internal opening could not be found." This idea was founded upon a false premise, and should not be heeded at all. After the main cut for fistula is made it is an easy matter to trace the channel to an internal opening, if one exists. If the opening is not definitely located, the probe or grooved director is carried beyond it, and it would be included in the cut. Granting that it might escape the knife, the lymph thrown out as the result of the operation will be sufficient to close it.

Abscess.—It is a recognized fact that all fistulæ in ano begin with an abscess. Indeed, if physicians would remember this and treat the abscess in the proper manner the percentage of fistulæ would be wonderfully reduced. It is an aphorism in surgery that just as soon as pus is detected it should be evacuated, yet it is a strange truth that many physicians when they meet with abscesses around the rectum will advise the patient to "allow it to break" of its own accord. This would have been poor surgery many decades ago, but in this day of antiseptic surgery it is inexcusable. Around the rectum is a rich field for sepsis, securing as it does an abundant blood-supply, and a free distribution of lymphatics. No abscess should be allowed to go an hour without complete opening and free drainage; especially is this true of abscesses around the rectum, which are followed in such a heavy percentage of cases by fistula.

Although it is a recognized fact that abscess in this region generally ends in fistula, it has been a point for discussion why it should be so. Many account for the fact by the statement that the circulation here is feeble, because of the absence of valves. A factor of great importance is that the tissues are soft, and often flabby, and are unable to offer great resistance to the inflammatory process, and constitute poor ground for repair. Besides, it must be remembered that certain diatheses or cachexias render these tissues peculiarly susceptible to the destructive process of inflammation. But even in a healthy condition the inroads from the inflammatory deposit are often such as to make an active and destructive condition which unless heeded at once ends in a serious complication of affairs.

The injunction to open the abscess around the rectum early and *sufficiently* is of paramount importance, and the second, to secure thorough drainage, is of nearly equal importance. It will often be necessary to give the patient chloroform to accomplish this.

Causes.—In speaking of or considering the causes of fistula in ano, the question really is, What is the *cause* of the abscess which invariably precedes the trouble? Fistula, in fact, is but the sequel and the abscess the real cause. As has been mentioned, the enfeebled circulation caused by deficiency of valves plays a part, no doubt, in the formation of abscesses in this locality, and the same reason may be productive of changes which prevent the healing of the same, hence giving rise to fistula. In a paper read by the writer some years ago, before the American Medical Association, on the subject of fistula in ano, he ascribed to the contraction of the sphincter muscle a power to prevent the healing process of an abscess contiguous to the rectum or anus, and suggested that in opening these abscesses it would be a good idea to freely dilate or paralyze the muscle.

Amongst the many causes which tend to produce fistula may be mentioned trauma, foreign bodies in the rectum, irritation from diarrhœa or dysentery, pressure of the child's head during labor, impressions made by extreme cold, etc. But it must not be forgotten that special diatheses play a great part. The tubercular subject is especially liable to abscesses around the rectum. It is not intended to convey the idea that these are, pathologically, true abscesses, yet the condition ends in fistula, and that is the disease under consideration. How to deal with such a condition will be considered under a separate head. In a word, fistula is caused by an abscess, and an abscess is caused by the germ of suppuration.

Symptoms and Diagnosis.

Fistula in ano is easily diagnosticated, for in remembering its pathology search is at once made for the sinus or the physical signs

of it. The symptoms of an abscess, which is the initial stage of fistula, are very decided, especially if of the acute variety. All the symptoms of inflammation are usually present, great pain, redness, heat, swelling, and tension. The appellation "cold abscess" is a misnomer and should never be used. All such are of *tubercular* origin. It is well to remember that fistulæ are oftentimes secondary to, and caused by, an ulceration, or ulceration and stricture, of the rectum. In all such cases, of course, the primary disease must be treated first. After the abscess is lanced or broken, in a certain percentage of cases no fistulæ will follow, but in quite a heavy percentage it will result. The first symptom that the patient will notice is a discharge from the sinus or opening which he has detected. In the female, especially, it will be the soiling of the linen that has attracted attention. It will be imagined by the patient that the "old disease" has returned, and censure of the physician will likely follow, for not having cured the abscess. It is well, whenever an abscess around the rectum is treated, to warn the patient that fistula may result. If it does not the physician gets the credit of curing the disease, and if fistula should follow he is fortified by a good prognosis.

When the patient has explained his symptoms, an examination should at once be made. An ocular inspection of the parts will reveal a good deal. If an external fistula exists, it can be seen, and if no external opening can be detected it may be that it has but recently closed. Sometimes the patient will give the history of the sinus "weeping" for a time and then ceasing to do so. This is accounted for by the fact that the external sinus closes and reopens. If this is the condition of affairs, or if there is no external opening, a closer scrutiny of the parts should be made. It will then likely be discovered that the pus discharges from the rectum. If a history of abscess has been given it is now safe to conclude that an *internal* fistula exists. In such a case the finger should be inserted into the rectum and perhaps the opening can be found. If not, by the use of a speculum and a good light the oozing of the pus from a certain point will indicate the internal opening. In either of the varieties of fistula, a "cord" can be felt and traced by pressing gently over the surface externally. This is the channel, and the course can often be made out by touch. By taking a probe and inserting it into the external opening and allowing it to find its way with only gentle pressure, it can sometimes be determined whether it is complete or incomplete. In this, however, the physician is often misled, for the channel may be complete but is so tortuous as to baffle any effort at the introduction of the probe. What has been said in regard to the useless attempt to locate the internal opening can be made to

apply to the effort to determine the course of the sinus, or the number of sinuses. This will be determined during the operation.

By the majority of physicians, fistula in ano is regarded as a simple affair, and it is expected that the disease will be found always as one of the three divisions mentioned in the books. So great is the diversity of character of fistula that no accurate description can be given of this disease except in a general way.

Tubercular Fistula.—Time was when it was believed, nearly universally, that to operate upon a tubercular patient for fistula in ano was grossly improper. Even more—that to operate upon the *healthy* subject for the disease was wrong. The idea prevailed that there was such intimacy between the lungs and rectum that if the discharge from fistula ceased, whether by operation or otherwise, it would "go to the lungs." Many people to-day hold to this old theory, and it is not uncommon for patients to ask the question, "If I have my fistula cured, won't I have consumption?" In the light of modern investigation one might say, "If you do *not* have your fistula cured you may have consumption." Tissue everywhere is likely to take on tubercular change. There is no exception to the rule from the top of the head to the sole of the feet. Tubercular disease in its various phases may be seen and recognized in any general hospital affecting the scalp, the bones, the joints, the tissues, the muscles, etc. The neighborhood of the rectum is not an exception, but on the contrary is frequently the seat of tubercular deposit. It is well recognized to-day that tuberculosis may be a local disease, from which the general constitution may become infected. Hence it is that when this local condition is detected, the surgeon immediately attempts to prevent further invasion by removing the affected part. If it is a knee-joint it is excised; if bone, it is removed or scraped; if the rectum, in the form of fistula or ulceration, it should either be curetted or trimmed out.

The diagnosis of a tubercular fistula is comparatively easy. The opening is large and flabby, allowing the finger to enter oftentimes with ease. The tissues surrounding are pale, the blood-distribution very feeble—to such an extent that when the tissues are divided very little bleeding occurs. In addition to the physical signs a specimen should be subjected to the microscope for the detection of the tubercle bacilli. It is true that in many cases the bacillus is not found when the disease actually exists, yet if it is observed it aids in the diagnosis. Other signs which can be noticed are: the sphincter muscle is weak, the tissues around the opening are undermined, the edges of skin around the opening blue and pale.

In regard to operating upon a phthisical patient who has fistula, there are just a few points to be considered: If it is a case of rapid

phthisis, and the patient has but a short time to live, no surgeon would think of adding additional pain and inconvenience by operating upon any fistula that might exist. But these cases are the exception, for, admitting that one has phthisis, its progress may be very slow indeed, and many subjects of the disease are cured. If such an one has a fistula in ano, which is giving him great distress, it would be foolish not to give him relief. But fistula in ano, tubercular in character, may exist and be purely local, and by remaining the disease may become general. By removing the local foci we get rid of the germ of infection. The writer has seen a number of cases of tuberculous fistulæ, with ugly ragged, edges, overlapping an ulcerated surface, perhaps just at the verge of the anus, embracing the fibres of the sphincter muscle and causing great pain. He has been gratified in such cases by seeing all distress abated after operation.

In the patient who has fistula complicated with phthisis, if an operation is done he should not be kept in bed, but should get about again in the shortest time possible. The recumbent position excites to coughing and thus militates against the healing process. It is much the best to assist him to walk out in the open air, even if a large wound exists. These patients should be fed on good nutritious diet all the time. The old impression that the wound would not heal in the tubercular patient is fanciful, for oftentimes the most beautiful results are obtained. Many patients complain much more of their fistula than of their lungs, and to these great relief comes not only physically but mentally as well. The writer cannot concur in the opinion expressed by some authors, that as long as the fistula is insignificant and discharges but little, it should be left alone. The question in such a case to determine is whether the fistula is of tubercular origin: if so it should be removed; if not it could be left alone.

Operative Treatment.

There is but little palliative treatment for fistula. In the great majority of cases nothing but an operation will effect a cure. The abscess, which is but the forerunner of fistula, can be palliated, so far as the pain is concerned, by the application of heat, etc., but even here it is much the best plan to resort to surgery by lancing it freely. In regard to operating for fistula it should be first determined what kind of fistula exists. As has already been intimated, the opening, either external or internal, betrays but little as to the extent of the disease. The injunction to divide the tissue upon the director will hold good only in those cases where the track is single—not complicated by diverging sinuses. It would be a most difficult matter to say just what amount of surgery would have to be done in any single case. Indeed, very few cases of fistula are alike.

As to the methods they can be included under the following heads: (1) Injections; (2) Elastic ligature; (3) The knife.

Injections.—Patients, as a rule, are very averse to the use of the knife, especially in rectal affections. This antipathy has been brought about by the advertising charlatan, who proclaims a cure for all such affections without the use of the knife. Of course this is the veriest nonsense, yet many are enticed into their care by such representations, or rather misrepresentations. Can fistula in ano be cured without surgical means? The question must be answered in the negative in so far as the majority of cases are concerned. Some of the older writers mentioned the plan of injecting the fistulous sinus with some agent which would excite to the granulatory process, and by this means close the channel. It was, therefore, suggested to inject into the opening, by means of a small syringe, iodine, solution of silver nitrate, diluted acids, etc. This plan is still vigorously followed by some quacks in order to bear out the assertion that the knife is not used. To say that this manner of treating fistula is of but little account is putting it mildly, for instead of benefiting it would very often be productive of harm. No gauge can be set upon the amount of the caustic that is used, and violent inflammatory action might be excited, sufficient to cause an abscess and thereby add to the trouble. It is true that the external opening may sometimes be closed by the use of such agents, but that is just what is not desirable. By so doing pus would be confined and additional sinuses would form. It can be definitely said that the effect of all such methods is conducive of harm rather than good.

Elastic Ligature.—It was Professor Dittel, of Vienna, who first suggested the use of the elastic ligature for the cure of fistula. Had the professor lived in this day of aseptic surgery it is to be doubted if he would have made the suggestion. Certainly it cannot be claimed for the operation that it is aseptic, and that is what is most desired now in all surgical operations. The method consists in putting an elastic cord through the external opening, catching it in the rectum, pulling it out of the anus, and running a piece of lead with a hole cut in its centre over the two ends and tightening sufficiently to cut out. Many devices have been suggested for doing this, but the writer has found the simplest and best to be a grooved director with an eyelet, or hole, through the end of which the cord is passed. The objections to this plan suggested by Prof. Dittel are manifold:

(1) It is unsurgical. From all fistulous sinuses pus exudes, and the introduction of a foreign substance (the ligature) excites to an increase of it. It is impossible to irrigate the channel or apply any antiseptic to it during the progress of the cutting by the cord.

(2) There is no means of telling whether the sinus is a simple one

or not, and in the majority of cases there are diverging tracks. It must be conceded, then, that each individual sinus must be treated in like manner, which would prolong the cure indefinitely. What it would take the ligature, therefore, weeks to accomplish, the knife could do in a few minutes.

(3) It is painful and annoying. Some writers have claimed that very little or no pain accompanies this plan. It is not reasonable to suppose that several inches of tissue embracing the sphincter muscle could be cut through without pain, and this has not been the experience of the writer. Add to this that the discharge is continually soiling the linen, and it can easily be seen that it is anything but comforting.

The Knife.—It must be firmly impressed that fistula in ano is often a most serious surgical affection, and that it requires in many cases desperate surgery to effect a cure. It is no uncommon thing to find as many as twenty or more different sinuses leading to important structures and of great length. For practical use the external sphincter muscle is the most important in the body, and this is to be dealt with in any and all operations for fistula in ano. True, many of these cases are simple ones and require but little attention, but it must be borne in mind that these are the exception. The surgeon who believes that he can always cure fistula in ano by one single operation will find himself greatly deceived. In the first place it may not be desirable to complete the operation at one sitting, because of the damage which would be done to the sphincter. Secondly, however careful he may be, an undiscovered sinus may exist and prevent the operation's being successful. A patient might forgive an unsuccessful attempt at cure, but would never forgive being left in such a condition after the operation that he could not control the actions from his bowel.

The first step to the operation by the knife is to have the parts in as nearly an aseptic condition as possible. It may be urged that this is impossible, for the reason that we are dealing with a pus-disease. But it must be remembered that fresh wounds are to be made, and that the rectum is a favored spot for sepsis. Again, the office of the rectum—to receive the fæces—makes it a difficult part to be thoroughly cleansed and to be kept so. Notwithstanding these facts every precaution should be taken in order to do just as clean an operation as possible. Irrigations with mercuric solution and the use of iodoform dressings should not be neglected in any operation for fistula.

The principal advantages that the knife has over every other method of operating for fistulæ are: Every sinus can be sought out and divided; overlapping edges can be trimmed away; the operation is done quickly; and the wound can be dressed antiseptically.

The chief admonition for operating for fistula is to lay freely open

every sinus, or the result will be a failure. It might be presumed that by plastic deposit an additional sinus would be obliterated, but experience teaches to the contrary. These channels are lined by a tough, elastic membrane which resists the healing property of the inflammatory product.

Compared with all other methods practised for the cure of fistula in ano, the knife is the most surgical, most efficient, and the best.

STRICTURE OF THE RECTUM.

Stricture of the Rectum is one of the most serious conditions met with in that portion of the gut. It can be safely asserted that when caused by other than benign conditions it is incurable save by radical means, and then seldom so. The following is the usual classification: 1. Acquired; 2. Spasm; 3. Dysenteric; 4. Tubercular; 5. Inflammatory; 6. Traumatic; 7. Venereal or Syphilitic; 8. Malignant.

The first term used, acquired, is, to say the least of it, a very vague one. One can imagine how a stricture the result of venery could be acquired, but it would be difficult to conjecture how a spasmodic or cancerous stricture could be acquired. If such a classification is given it would be best to include it in a *congenital* variety.

Spasm.—If a stricture of the rectum ever really exists from spasm it should not be classified, because no pathological change exists. It would be only a symptom of disease elsewhere. Again, it seems impossible for the lumen of the rectum to be so materially affected by spasm as to constitute, or resemble, a stricture.

Dysenteric.—Dysentery is regarded as a frequent cause of stricture of the rectum. The writer, after a long experience in rectal surgery, cannot agree that it is so. Very many cases present themselves with symptoms of dysentery that have stricture, but upon investigation it will be ascertained that the dysentery (?) is the result of and not the cause of stricture. The process of ulceration after dysentery is not usually observed in the rectum, but in the colon, and it is here that the contraction would take place. Surgeon-General Woodward writes that he had carefully searched the Pension Office for the record of a case where a pension was drawn for the existence of a stricture of the rectum the result of dysentery contracted during the war, but could not find a single one. Certainly dysentery is not a *common* cause of stricture of the rectum.

Tubercular.—As has been affirmed, the tissues around the rectum are often the seat of tubercular change, ulceration, etc., but it is quite another question whether stricture often results from this cause.

The nature of tubercular tissue is to break down, and it would appear that in the capacious rectum this change would take place before the gut was constricted.

Inflammatory.—The term inflammatory is so broad and comprehensive that per force of reason it must be admitted that it is a common cause of stricture. May it not be asked if it is not the *only* cause of stricture? It would be difficult to understand how a stricture could be formed—this being always by deposit—without the process of inflammation going on. It matters little what the variety—trauma, pressure, dysentery, cancer, tuberculosis, syphilis, or what not—this suggestion obtains. Even a simple cicatrix, which would contract the gut, could not exist save by inflammation. Proctitis is nothing save an inflammation of the walls of the rectum, and it should not be said that a stricture is the result of proctitis, but that proctitis is the result of inflammatory deposit. What excites to this proctitis is another matter, and sometimes difficult to tell.

Traumatism.—Under the head of traumatism it is common to name ulcerations following operations or wounds above the rectum. Of course traumatism excites to inflammation, and inflammation to a deposit, and the deposit to contraction—hence stricture. But, after all, this is inflammatory, and the pathology is found in this process.

Venereal.—Under the head of venery, as a cause of stricture of the rectum, three conditions are mentioned: chancroidal, secondary, and tertiary ulcerations. Fournier describes an unusual form as resulting from a gummatous deposit. It is certainly not shown that stricture of the rectum is due to the extension of chancrous pus, nor that it results from unnatural intercourse. The writer in his book on diseases of the rectum [1] attributes 60 per cent. of the strictures of the rectum to syphilis. Not in the way of chancrous extension, or unnatural intercourse, but to changes which take place the result of cell-proliferation—an "anal-rectal syphiloma." Further experience has not changed his opinion, but confirmed it.

Malignant.—In all cases of cancer of the rectum stricture will be detected at a certain stage. The hyperplasia, gradually increasing, infringes on the walls of the gut and narrowing takes place. It is very seldom that a physician sees a case of cancer of the rectum until a decided contraction has taken place.

Symptoms and Diagnosis.

The symptoms of stricture of the rectum are very insidious indeed. It is a remarkable fact that strictures often exist which would not permit the entrance of a lead pencil, and yet no special symptom is complained of except constipation; this is especially true of the

[1] *Diseases of the Rectum, Anus, and Sigmoid Flexure.*

syphilitic form of stricture. If, however, the passages are observed a discharge can be seen which is either mucus or pus, or is mucopurulent, and sometimes a slight amount of blood. Pain is not often a factor in the venereal stricture, and the same may be said of strictures from benign causes the result of simple inflammation. In cases of stricture the result of cancer the reverse is often true, the pain being very severe—sometimes constant, sometimes exacerbating. If the malignant growth is well above the sphincter, it will be observed that pain is not nearly so severe as when situated within the grasp of the muscle.

The only correct way to properly diagnosticate a stricture of the rectum is to introduce the finger. If within reach it is easily detected, and in the vast majority of cases strictures are within reach of the finger. The clinical history of the case must reveal the character of stricture. Sometimes the microscope can be used to advantage.

Treatment.

There are numerous plans recommended for the treatment of stricture of the rectum. They can be summed up in these: 1. Dilatation (gradual or forcible); 2. Incision; 3. Electrolysis and Raclage; 4. Excision; 5. Colotomy.

Dilatation.—Although recommended by many, *gradual* dilatation will be found less serviceable than *forcible*. The chief advantage in the latter is that the stricture can be broken to the full capacity of the gut in one sitting, while with gradual dilatation it would require months to accomplish this much.

When it is remembered that stricture of the rectum is located nearly invariably within three and one-half inches of the outlet, it can be readily seen that the danger in forcible dilatation is nearly *nil*. When gradual dilatation is practised, constant irritation is kept up, which favors plasma, and if the process is left off a little time, recontraction occurs. If a stricture is located high up in the rectum—in the movable gut—it is dangerous to attempt dilatation by any method.

Incision.—In certain forms of stricture the incision plan is to be highly recommended. There are two methods, called respectively *internal* and *external* proctotomy. The internal is, in the writer's opinion, to be preferred. It is urged for the external that it is best in order to get proper drainage. Even if this were true the ill effects of a complete division of the sphincter muscles would outweigh the objection. Internal proctotomy is not dangerous when properly performed; and the writer has never had periproctitis follow after practising it. Of course antiseptic precautions are to be followed as strictly as possible.

Electrolysis.—The method of treating stricture of the rectum by electrolysis has not met with great favor in the United States, but is advocated with great earnestness by a few. By its advocates the following advantages are claimed:

(1) That electrolysis in the treatment of stricture is not a panacea; on the contrary, failures may happen and will irretrievably fail if the stricture is due to carcinoma.

(2) Electrolysis will give improvement when all other methods fail.

(3) Electrolysis will cure a certain percentage of cases without relapse, and without the necessity of an after-treatment or the use of bougies.

(4) The best chances for a cure are with fibrous inflammatory strictures.

Excision.—To the surgical mind, excision of a stricture sounds ideal, yet there are many things to be considered before it would be attempted. First, the etiology of the stricture must be defined before the plan of treatment is adopted. Where a simple fibrous band is stretching partly around the lumen of the gut, the simplest thing would be to divide it. If it is of tubercular origin, it would be impracticable to excise it; and if it be a stricture caused by either syphilis or cancer, the operation would amount to an extirpation. It must also be considered that to excise a stricture, the sphincter muscle must be involved in the operation, and the results must be anticipated. Extirpation will be considered under the head of Treatment of Cancer.

Bacon has devised a plan by making a new channel around the stricture by folding the gut above the constricted portion down over the stricture and anastomosing it with the rectum below the contraction, afterward clamping away the septum that has formed.

Colotomy.—Whatever might be the nature or cause of stricture, the strongest advocates of colotomy could not plausibly advocate it as long as the patient could have a moderately free evacuation from the bowels, and there was no danger from hæmorrhage. Pain is rarely so excessive, even in cancer of the rectum, as to justify colotomy, especially if the bowels move freely. If the question of colotomy is upon the propriety of operating for stricture *per se*, it might be answered that where total or nearly total obstruction exists and the stricture is in the movable gut, beyond the reach of the finger, colotomy is advisable. Stricture the result of syphilis is an ideal condition for this operation when located as herein stated.

CANCER OF THE RECTUM.

Of all affections of the rectum, cancer is the most serious. Unfortunately, too, it is scarcely ever met in its incipiency, and the chance for a cure is lost, or at least is a minimum.

The medical world is still in the dark in regard to the cause of cancer, in the rectum or elsewhere. Many pages have been written in advocacy of the position that the disease is hereditary, and others are equally of the opinion that heredity plays no part. It is believed that a long-continued local irritation is conducive to malignancy. Future investigations may upset all theories of the present in regard to the cause of cancer. The consensus of opinion is that age plays a part in the development of the disease, it being said that middle life is the favorite time, then advanced age. The writer has reported several cases in patients under seventeen years of age. Women are said to be more liable to cancer than men. This may be true so far as the body as a whole is concerned, but there can be no reason why they should be more exempt from cancer of the rectum.

It is not the intention of the writer in this short space to enter into a discussion of all the classifications of cancer of the rectum, or to go into a debate on its nomenclature, but rather to mention only the practical points. For all purposes the term *adeno-carcinoma* is quite sufficient, for the other varieties can really be included under this head, pathologically and microscopically. A further classification would also divide *adeno-carcinoma*, which would be confusing and be of no practical utility. These fine points can be decided after the removal of the growth rather than before.

Symptoms and Diagnosis.

Cancer of the rectum is a most insidious disease, often in its incipiency presenting no symptoms worth mentioning. It is only after the growth has existed for some time that any positive evidences of cancer are given. Among such signs may be mentioned the pale and waxen aspect, the peculiar odor, disposition to bleed, frequent stools, muco-purulent discharge, etc. Pain sometimes is intense, and at others not sufficient to be called a factor, and when it does exist there is generally violent straining at stool, which is distressing.

Treatment.

It might be said that as regards treatment of cancer of the rectum the reverse of an axiom in surgery would obtain. Ordinarily in diseases requiring extirpation it is advisable to wait for the full development of the disease, and to use palliative measures until it does mature. In cancer an operation would be advisable during the

incipiency of the disease, and palliative measures discarded. But the affection being so slow to manifest itself, all chance to operate has passed when the diagnosis is made, and nothing is left but to palliate.

If the cancerous mass protrudes from the anus, a free application of powdered burnt alum will have the effect of reducing it. Another excellent application is arsenite of copper with mucilage, as a paste. After all, what the patient desires in the way of palliation is relief from pain, and of all the remedies to accomplish this opium in some one of its forms is the best. The writer can see no objection to prescribing this drug freely, where the case has been decided to be an inoperable one. If the life of such an unfortunate can be made in any way comfortable by the use of opium, he should have it. Some other things should be looked after, such as diet, position, and especially the keeping of the parts free of débris, by frequent irrigation with antiseptic solutions. If a close stricture is within reach, and is obstructing the passage-way it should be divided, and sometimes a free curettement will do good by relieving nerve-pressure.

Operation.—The writer is on record as opposing either one of the operations for cancer, *excision* and *colotomy*, except in the rarest of cases. If the cancerous patient can have his actions in a moderate degree of comfort, and there is no risk of life from hæmorrhage, there could be no logical reasons for doing a colotomy. If pain is urged as a reason for the operation, it could be answered that much could be done for the relief of pain by doing one of the minor operations. It must be admitted, even by the most vehement advocates of colotomy, that the operation is really nothing less than a palliative means. The diseased structure is left to go on with its ravages without any hope of cure. The operation is not a pleasant one to contemplate, to say the least of it, and though it may and does relieve pain in some cases, in many others it fails to do so. Then it might be urged that opium would accomplish this without an operation.

As to excision of cancer, as has already been said, it is the ideal method of treatment *provided* that the whole cancerous mass can be enucleated. But the question is, Can this be done? Surgeons of much experience in dealing with cancer of the rectum say that this can rarely be accomplished. The rectum is so abundantly supplied with blood-vessels and lymphatics, that it forms a suitable bed for absorbing and propagating the cancerous material, that by the time the surgeon sees the case, contiguous organs have been involved and gland-infiltration has taken place.

Of what avail is it to remove a portion of the rectum, when the whole of it is involved? What is accomplished if the whole is removed, if other organs are implicated. There must be a line drawn—outside of the age of the patient, physical conditions, etc.

The matter should be settled whether really there is any chance of cure, before submitting a patient to either of these radical procedures. Of course, if by colotomy life can be saved, or great pain relieved, the operation would be warranted; or if by excision the whole mass could be removed and leave other organs unaffected, it would be justifiable.

PROLAPSE OF THE RECTUM.

In the adult, prolapse of the rectum is infrequent, but it is often met with in children. Prolapsed hæmorrhoids are sometimes mistaken for true prolapse of the bowel, and oftentimes there is some prolapsus with an aggravated case of piles. Then, too, there is a vast difference in the character of prolapse. In one variety only the mucous membrane is involved, while in another all the coats of the bowel, and often the peritoneum, help to constitute it. In forming an opinion as to which variety exists, the size and the history play a part, and taxis will reveal a good deal to the expert surgeon. The mucous-membrane variety signifies no danger either in treatment or otherwise, but in dealing with the second variety danger is to be apprehended.

Symptoms and Diagnosis.

The most positive symptom of prolapse is of course the protrusion of the bowel at stool. Children not being subjects of piles, any protrusion of the bowel at stool would indicate either a polypus or prolapse. In the adult this protrusion should be carefully inspected in order to differentiate between hæmorrhoids and true prolapse. Straining at stool causes the nurse to observe that something is the matter, and by ocular inspiration a small red tumor is seen pushing through the anus. By taking hold of it, it can readily be told whether it is a polyp or prolapse.

Treatment.

The treatment of prolapse is both palliative and operative. In children especially, the cause should be looked after. With this class of patients the most common cause will be found to be pin-worms. Anything that excites to an irritation and violent effort at straining will produce the affection and should be sought for.

The best manner of treating prolapse of the rectum in a child is the following: Administer a dose of castor oil; after it acts give a high enema of salt water, then a dose of paregoric; apply adhesive straps across the two buttocks, bringing them firmly together. Put the child to bed for one week; on a light diet; on the fifth morning give a dose of oil. Remove straps when bowels move, which should be

in the erect position ; wash out the bowel with cold water, and keep stools gently soluble and open. In the majority of cases this plan will succeed in curing prolapse in the child, and some suggest washing the prolapsed bowel each time with some astringent, but it seldom accomplishes the purpose.

The mildest operative treatment is that suggested by Van Buren, which consists in applying the actual cautery at a dull-red heat to the tumor in stripes radiating from above downward. To do this requires the use of an anæsthetic and looks a little barbarous. The writer has never had to resort to this treatment in children, but has used it several times in the adult with moderate success. For the treatment of an old or chronic prolapse in the adult, especially in the aged, a much more radical method has to be adopted. It has been suggested to amputate the entire tumor.

It will be found that, in the aged, prolapse of the rectum does not give as much distress as one would imagine, and before deciding upon so radical a procedure as the removal of the entire tumor the surgeon should give serious thought. Many of us have seen such a "tumor" assume the proportions of a man's head, and yet the patient complain very little from its effects.

RECTAL POLYPI.

It would be quite an easy matter to mistake a rectal polyp for prolapse of the bowel, in an infant, if an examination was not made. The nurse would be apt to say in both instances that a "small red tumor" was presenting at the anus. By examining, the difference can be easily told, as the polyp has a distinct stem or pedicle, while prolapse takes in the entire circumference of the bowel. Polypi are often found in children, but it must not be supposed that they are confined to this class. In the adult these tumors sometimes are of very large size, and have a stout pedicle. They often exist at the same time with other affections of the rectum, notably piles. In searching the gut for them, the effort must be very thorough, as they often elude the finger. Whatever their size, character, or location, the only treatment is to remove them. If they can be caught, held, and ligated, this is undoubtedly the best, as this tumor is sometimes supplied with a large-sized artery. If this plan is impracticable, then the polyp should be twisted off and the case watched for hæmorrhage.

PRURITUS ANI.

One of the most distressing affections of the human body is a pronounced case of pruritus ani. Patients who suffer from it often say that they would much prefer to endure pain than to suffer from the intolerable itching. No class of people is exempt, for the rich bring it on by excesses in both eating and drinking, and the poor perhaps by other habits equally productive of it. Age has but little influence, although it is most commonly found in middle life, and it pays no respect to sex, as both the male and female suffer from it. Sometimes it exists in a very mild degree, at others it is of the most tormenting character.

Pruritus ani often appears as a distinct eczema, but more frequently nothing can be seen to indicate any pathology. Whilst pruritus may and does often affect other portions of the body, the anus is the most favored seat. When present, it is aggravated by certain articles of diet, by smoking, by drinking alcoholic liquors, by excessive venery, by eating peppers, etc., but it is doubtful if any one of these is ever the direct cause of the trouble. It is most intense when the parts are heated, hence is worse after the patient has retired for the night and has gotten warm in bed. The disposition of the affection is to localize itself, but in some instances it extends to the scrotum, buttocks, and far down the legs. If it has existed for a long time, by inspection a distinct scarf-skin can be seen—white, glistening, and very smooth. After treatment the disease will often disappear, and the patient will express himself of the conviction that he is entirely cured, but from the slightest indiscretion in diet or drink it will suddenly appear again.

Treatment.

The first thing to do in a case of pruritus is to inquire after the habits of the patient: whether he is an over-eater; indulges in alcoholic or malt liquors; is a tobacco-user; is a man about town, and indulges his sexual appetite to an abnormal amount; is a drinker of tea or coffee. Each and all of these should be interdicted before treatment is begun. It may be that some special article of diet brings on an attack, and this should be carefully investigated by the patient. Obstinate constipation may have something to do in producing or keeping up the trouble; therefore this should be corrected by the use of aperients. The following is a good laxative:

℞. Sulphur. sublimati,
Potassii bitartratis, āā. ʒiv (120.0).—M.
Sig. Teaspoonful in glass of water, before breakfast.

It is also well to look to the secretion of the kidneys, to the amount of urine passed, and the constituents of the same. When loaded with the oxalates or urates, a disposition to itch is often established. In a general way it is well to advise the patient to take frequent hot baths, especially at night before going to bed. The Russian or Turkish bath will be found of excellent utility in protracted cases of pruritus. If the patient is "run down" in health, it is all-important that he be built up; especially is this true if there is any special diathesis manifest, as syphilis, tuberculosis, etc. For these, special treatment should be accorded, such as small doses of bichloride of mercury, potassium iodide, cod-liver oil, iron, etc. In another class of patients it will be found that the nerve element plays an essential part, and the neurotic symptoms must be ameliorated. It is a difficult matter to map out any definite plan of treatment, as nearly all cases of pruritus are individual ones and must be thoroughly traced and then prescribed for.

As to local applications there are hundreds, many of which are claimed by some to be specific in their action, but which after a few trials will be thrown away by others. In cases that partake of the eczematous variety, Dr. Bulkley recommends the following:

R. Liq. carbonis detergens (Wright's), ℥j (30.);
Glycerini, ℥j (30.);
Zinci oxidi, ʒss (15.);
Pulvis calaminæ præp., ʒss (2.);
Aquæ, ℥vj (180.).—M.
Sig. Apply with brush and allow to dry, daily.

In this variety, also, pastes are sometimes to be preferred to solutions or ointments, such as—

℞. Hydr. chlor. mit.,
Bismuthi subnit., *āā.* ℥ss (15.).—M.
Sig. Dust on parts, or rub in with finger frequently.

One of the best of agents to stop itching is ichthyol:

℞. Vaselini, ℥j (30.);
Ichthyol., ʒj (4.).—M.
Sig. Apply.

Or,

℞. Ungt. aquæ rosæ, ℥j (30.);
Menthol., ʒj (4.).—M.
Sig. Apply morning and night.

When other remedies fail, bichloride of mercury either in solution or ointment will give good results:

℞. Vaselini, ℥j (30.);
Hydr. bichlor., gr. viij (0.52).—M.
Sig. Apply.

Suppositories, as a rule, do not accomplish much in these cases, but the writer has derived benefit from the following:

℞. Cocainæ hydrochlor., gr. iij (0.195);
Ol. theobromæ, q. s.
M. ft. in suppositoria No. vj.
Sig. Use one at bed-time.

In lieu of all ointments it will, with a certain class of these patients, be found best to use powders or dry dressings, such as calomel, bismuth subnitrate, starch, etc. In the moist variety the patient should be advised to wear a well-adapted pad of oakum against the anus. When the disease resists all such local treatment, a more radical method is the use of the galvanic cautery, curettement of the surface, the application of pure carbolic acid, tincture of iodine, or campho-phénique. It should not be forgotten that a neurotic element may predominate, and nothing will cure until this element is dissipated and the general health is built up.

FISSURE OF THE ANUS; IRRITABLE ULCER OF THE RECTUM.

A DISTINCTION should be drawn between a fissure and an irritable ulcer. Most books speak of fissure of the rectum; this is a misnomer and anatomically incorrect: a true fissure could not be formed in the *rectum*, but the anus is the common seat of such trouble. The rectum, however, is the seat of irritable ulcer, and the reason for so calling it is that the ulcer falls within the grasp of the sphincter muscle. Ulcers are often found above this muscle which are not painful in the least although of good size. A fissure is a simple crack, or break, in the mucous membrane, at the verge of the anus, caused by a tear, likely, in passing hard fæcal matter. Of course any trauma of the parts might give rise to the disorder. At first the abrasion presents acute symptoms, as a fresh wound would, but after a while the pathological changes which constitute an ulcer take place. This fissure-ulcer, therefore, is oblong in shape, while the irritable ulcer is

oval and situated higher up. Of course a fissure is irritable, but a contradistinction must be made in order to treat the affections rationally. Fissure of the anus is the most painful of all rectal diseases, except, perhaps, some cases of cancer in the same region. Indeed, many persons who suffer from fissure are firmly persuaded that they have a malignant growth. It is strange, too, that patients, especially women, will suffer the agonizing pain of fissure for years without consulting a surgeon. An ointment is used, and the disease may for a while seem cured, when suddenly after a stool the same terrible pain is experienced.

In the majority of cases of fissure, it is difficult to trace it to any definite cause. The use of printed paper as a detergent can be set down as one of the causes. Some people are in the habit of using hard and irritating substances for this purpose, as wood, splinters, corn-cobs, weeds, grass, etc. These, of course, may set up inflammatory action or cause a break in the mucous membrane which would result in fissure. The affection is common in syphilitic children. The childbearing woman is said to be a subject of fissure, though the writer has seen but few cases of fissure in the recently delivered woman.

If a polypus of the rectum exists with a pedicle sufficiently long to allow the tumor to protrude at stool, this would be a pronounced cause for fissure. It is well in all cases of fissure to examine the rectum not only for polypi, but for other things which may be the primary cause. Some authors speak of fissures resulting from surgery around the rectum, notably for hæmorrhoids, but in the writer's whole experience he has never seen such a case. Nor can he subscribe to the view expressed by some that displacement of the womb may cause the anus to become fissured. An irritable ulcer above or encroaching on the sphincter is more likely to be caused by such displacement. Straining, or pressure from hard fæcal matter, would likely produce a fissure.

Symptoms and Diagnosis.

Patients who have fissure of the anus will give the history in about these words: "It makes very little difference so far as pain is concerned, when the bowels move, for I know that in about twenty minutes I am going to suffer. It begins as a sharp, cutting, contracting pain, and increases until it seems unbearable. No position that I can assume does any good, and I have it for from two to six hours, when it gradually wears off, and I feel perfectly easy until my bowels move again." This is a common history, and the affection has by physicians been called many names, the most common of which is "piles." It can be set down as an axiom that, if much pain is suf-

fered by the patient, the disease is not piles, for piles in the quiescent state cause very little if any pain.

A fissure may be a very simple affair, only a slight tear through the mucous membrane, or it may be a very complicated and ugly condition. When due to trauma and treated early it will heal kindly, just as any other fresh wound, but if left alone it will assume the proportions of an ulcer. Fissures may be the result of a constitutional affection, as syphilis, tuberculosis, etc., and cannot be effectually cured until constitutional treatment is afforded. The latter are ugly in character, often deep and ragged, and require more surgery than is necessary for the other kinds, such as divulsion, etc.

Fissures may be single or multiple, situated dorsally or lateral, rarely in front. They can be seen generally without a speculum, by drawing down and everting the anus. To detect an irritable oval ulcer higher up, a speculum must be used. An internal opening of a fistula may be mistaken for a fissure, for when located within the grasp of the sphincter the pain is very nearly identical; therefore it will often be necessary to use a probe in making a diagnosis. If the same treatment were adopted in such a case as in fissure, the pain would soon return. Nothing should be overlooked in these cases.

Treatment.

The treatment of fissure is usually described as both palliative and operative. Taking the pathology and the excessive pain into consideration, it would appear plausible to give the patient immediate relief by doing an operation. Yet patients, as a rule, are so averse to any surgery, when anything else can be substituted, that it may be necessary to use palliative measures in cases of fissure. The writer is on record as advocating an operation in nearly every case of fissure, his reason being the rapidity with which a cure is effected in contrast with a long palliative treatment with indefinite results. The palliative treatment consists in keeping the bowels gently moved with an aperient. Any good mineral water, as Apenta Rubinat or Hathorn, will answer the purpose; keeping the parts cleansed with soap and water, and the use of local applications. The best of these is silver nitrate, either in stick or a strong solution, mildly coating the full extent of the fissure. Sulphate of copper used in the same manner will be found serviceable, or in some cases pure carbolic acid. To use any of these it will often be found necessary to employ a small bivalve speculum and to gradually stretch the rectum until the full length of the fissure is seen. For an application to the oval irritable ulcer it is always necessary to use a speculum. An application to this form of ulceration will not generally be sufficient to effect a cure. It will be found necessary to scarify the surface thoroughly, and sometimes to

trim the edges. Divulsion, too, is of great importance in order to release the spasm or grip of the sphincter muscle. Besides the remedies which have been mentioned in the palliative treatment of fissure, a number of others less severe in effect are recommended. The following is used by Mr. Allingham:

℞. Hydrarg. chlor. mitis, gr. iv (0.26);
Pulv. opii, gr. ij (0.13);
Ext. belladonnæ, gr. ij (0.13);
Ung. sambuci, ʒj (4.).—M.
Sig. To be applied frequently.

A better one, in the opinion of the writer, is—

℞. Cocainæ, gr. xij (0.78);
Menthol., gr. xv (1.);
Hydrarg. chlor. mitis, gr. xxx (2.);
Vaselini, ʒj (30.).—M.
Sig. Apply two or three times daily.

Injections, to be used just after the bowels move, will be found serviceable, and the best is: One ounce of olive oil, containing five grains of iodoform and ten drops of laudanum. Good may be accomplished by having the patient take an injection of four or five ounces of linseed oil every morning before the bowels move. The physician can use his own judgment in selecting remedies of this class, which may be equally effective with any mentioned in the books.

Operation.—The operative procedure for fissure must be made to fit the case. A recent attack may yield to the simplest of local applications or to the mildest divulsion, while others will require heroic treatment. In children suffering from fissure it will often be sufficient to have the mother or nurse, each morning, anoint the fore finger and gently insert it into the rectum. After a few times it will be noticed that the infant complains less at stool.

Where a fissure has existed for any length of time in the adult, a more severe operation must be done. It consists in a free divulsion of the sphincter, a deep incision through the fissure, and a paring of the edges of the ulcer, or a free scarification of the whole surface. Originally it was thought advisable to *break* the muscle, and many practise that method yet, but such rash treatment will not be advisable in the majority of cases.

It will be found absolutely necessary in operating for fissure or irritable ulcer to administer an anæsthetic, for the pain incident to doing this operation would be unbearable.

After doing any one of the different operations advised it will be found important to watch the patient in regard to diet, regulation of bowels, cleanliness, etc., for some time, in order that a perfect cure be obtained.

NEURALGIA AND HYSTERIA OF THE RECTUM.

Neuralgia at best is a vague term, but when applied to the rectum is most difficult of description. There are so many ways in which pain can be referred to the rectum, that it would be a plain duty to trace the cause before coming to the conclusion that such pain was neuralgia. As to the term *hysteria* of the rectum, the writer has grave doubts as to the correctness of the expression. If pain actually exists it is his expressed opinion that it must be due to a local lesion, and if the premise is correct the idea of its being hysterical is dissipated. When it is remembered that the slightest lesion, abrasion, or tear around the rectum will excite great pain and distress, it can be easily understood that many cases of the kind will appear. Then, too, the affection may be so slight that no pathology, as inflammation, etc., is discernible, and hence a diagnosis of hysteria is rapidly jumped at. The simple exposure of the filament of a nerve may be sufficient to cause acute symptoms, and yet the said filament can be detected only with difficulty. It may be possible that if a patient is on the verge of insanity he might complain of pain in his rectum, or anywhere else, which would be only imaginary, and this is given as one of the cases of hysterical rectum.

Whatever may be the nature or cause of the trouble, certain it is that it is a most difficult thing to effect a cure. Patients of this class generally shift from one physician to another, and often to the satisfaction and great relief of the one that is left.

Symptoms and Diagnosis.

The patients suffering with neuralgia of the rectum are rarely able to give well-defined and intelligent symptoms. When asked to locate the pain they hesitate, and frequently contradict themselves. Some, however, complain of a distinct *spot*, and although nothing can be discovered by the physician at the point indicated, the patient will still insist on his declaration that something must be in trouble there. The pain complained of is generally of an acute nature, simulating very much the fissure pain, although not having the distinctive feature of being connected with the act of defæcation. Sometimes the pain is constant, and proves to be a great burden, showing its effect upon the general health of the patient. Vain imaginings take possession of the

patient, and the fear is constant with him that the trouble is malignant. Women are most often the subjects of this affection, and prove to be very troublesome patients. All effort at relief oftentimes proves futile, and they become real objects of pity.

The writer is firmly convinced that neuralgia of the rectum is caused, in the vast majority of cases at least, by a pathological change somewhere; that, if it be in the rectum, a filament of nerve is exposed, and if the disease does not emanate in the rectum it is made manifest there through some one of the reflexes. There are many conditions that could cause such manifestations, such as an irritable prostate, stricture of the urethra, a sensitive ovary, a displaced womb, a diseased coccyx, or a spinal irritation. In persons given to the opium-habit will be found a disposition to complain of imaginary pains, and the rectum will not escape their attention.

Treatment.

If it could be definitely settled that any given case was due to an hysterical disposition, of course all treatment should be directed to an effort to overcome it. But such efforts will, in the main, be found utterly futile. The mind should be diverted by travel, new associations, active business, etc. Good substantial food should be provided, proper hygiene observed, the bowels regulated, and the secretions watched. The local disturbance, going upon the premise that a lesion exists, should be diligently sought for. It may be a simple filament of an exposed nerve, which if found and divided, or cauterized, will heal. If none such can be discovered, then the reflexes should be traced, and the origin may be found in some contiguous organ, as the uterus, ovaries, urethra, prostate, or possibly the coccyx. If in the latter it should be removed, or if in any one of the others they should receive proper attention.

It will be found often in cases of neuralgia of the rectum that a great amount of mucus is discharged; this is caused principally by reflex disturbance, and not from any real inflammatory condition. It is well, however, to use some mild astringent injection, as lead acetate, boric acid, fluid hydrastis, or pinus canadensis. If the pain is intense, local applications of silver nitrate, carbolic acid, or copper sulphate may be useful.

Although the character of pain would indicate that free divulsion of the sphincter muscle would be indicated, it will be found that it does no good. A much better plan is to divide the muscle by incision.

As internal remedies such agents as arsenic, the bromides, iron, and strychnine are the best. Along with these cod-liver oil, or the hypophosphites will be of benefit.

VILLOUS TUMOR OF THE RECTUM.

Comparatively few villous tumors of the rectum have been reported; indeed thirty would cover the number. The writer has met with two cases in an experience of nineteen years in rectal surgery. The tumor is recognized as a spongy mass with long villous-like groups over its surface, and has a broad stem which attaches it to the wall of the bowel. The tumor may have its origin in any portion of the rectum, but they are usually situated low down, in reach of the finger. In the writer's cases no pedicle could be made out, but, instead, the base was broad and short.

Symptoms and Diagnosis.

A villous tumor of the rectum could be easily mistaken for a mass of hæmorrhoids, as it protrudes during the act of defæcation. A better diagnosis can be made by feeling the mass while in the rectum. Hæmorrhoids cannot be so felt. From polypi they can be diagnosticated by the soft spongy feel, instead of the firm and solid appearance of a polyp. Then, again, the great disposition to bleed, and the free discharge of mucus, is nearly characteristic. The question has often been raised whether these growths are not really malignant and would return if removed. As has been stated, the writer has removed two villous tumors of the rectum, and although a number of years have elapsed they have not returned. There is not the gland-involvement and the cachexia in these cases that is found in cancerous growths, neither is there the loss of flesh that is so characteristic of the latter. There can be no question, however, that a villous growth can and sometimes does undergo cancerous degeneration. Authors have reported their recurrence after removal, and, in a few cases, death from malignant disease.

Treatment.

There is but one plan of treatment for a villous tumor, viz. removal. It is fair to say that in this modern day of research no one would question the advisability of removing any tumor wherever located, but especially is this true of a growth that in any way resembles malignancy or is likely to become malignant. The best plan of operating for this class of tumors is by double transfixion and cutting away the mass. It has been mentioned by a few writers that villous tumors of the rectum sometimes "shed" themselves, thereby saving an operation, and that the patients have recovered.

PROCTITIS.

There can be no question that the rectum is frequently the seat of inflammation. There are many causes that would be conducive to this state: for instance, hardened fæces remaining in the pouch of the rectum; foreign bodies in the rectum; continued nerve-irritation; gonorrhœal infection, worms, unnatural intercourse, and trauma. It has not been the observation of the writer that constipation is often an exciting cause, and he holds to the theory that accumulations of fæces seldom take place in the rectum.

Symptoms.—The most prominent symptom of proctitis is a sense of heat and weight in the rectum, straining at stool, some tenesmus, a discharge of mucus, sometimes tinged with blood, an uneasy sensation after stool as if the bowels had not been completely evacuated, and an interference with the proper action of the bladder. Upon examination by the speculum, nothing will be discovered but a highly colored and sensitive mucous membrane.

Treatment.

The patient should be put upon bland nourishment; the bowels moved daily with an aperient water, preceded possibly by a dose of calomel; the secretions of the kidney watched, and sexual intercourse interdicted. The rectum should be washed out daily with copious injections of hot water containing boric acid, and followed by mild astringent washes, as fluid hydrastis, borax-water, or a mild solution of lead-water. Anything stronger than this is scarcely necessary.

DIARRHŒAL DISEASES AND DYSENTERY.

By W. W. JOHNSTON, M. D.

ACUTE INTESTINAL CATARRH (ACUTE CATARRHAL ENTERITIS; ACUTE DIARRHŒA).

By an acute intestinal catarrh, acute enteritis, or entero-colitis must be understood an inflammation of the mucous membrane from the pyloric orifice to the rectum. The disease may have several varieties as to intensity and involvement of more or less of the intestinal tract. There may be every grade of inflammation from superficial catarrh to that in which there are glandular and lymphatic changes. Such anatomical changes may so involve various portions of the intestine that a study of the symptoms for the localization of the disease is necessary to the proper direction of the treatment. Diarrhœa is not present in all these forms; the only positive symptom of acute intestinal catarrh is the presence of mucus in the stools, whether the movements are diarrhœal or not; thus the treatment of the disease would vary with the intensity, the localization, and with the consideration of the etiological factors, predisposing or exciting.

Some of the predisposing causes that influence the treatment are primarily such as occur in the weak and debilitated, and in old people. Among other predisposing causes are vicissitudes of temperature, extreme heat of summer, poor hygienic surroundings, improper food, impure drinking-water, insufficient clothing, and previous and frequent attacks.

As secondary causes, predisposing to intestinal catarrh, may be mentioned extension of disease, as from gastritis, proctitis, peritonitis; disturbances of the venous circulation; infectious diseases, as epidemic influenza and sepsis; chemical irritants acting through the blood, as urea, or toxic substances absorbed by the skin from extensive burns and eliminated through the biliary secretion.

The most common exciting cause is some error in diet in quality or quantity, more seldom a chemical substance in a concentrated form, as drastics, mercury, phosphorus, or arsenic. More frequently a chemical irritant, formed in the fermentation and decomposition of food and in bacterial growth, is the proximate cause. Thus various

irritating organic acids, ptomaïnes, toxins, and toxalbumins are formed, and set up and maintain a functional disturbance of the proper mechanism of the intestine. That these new chemical poisons —toxins—are sufficient to cause as well as sustain irritation of the intestine is shown by the erythema produced on the nates from contact of the diarrhœal discharges. The danger to the patient lies in the absorption of these toxins by the blood and by the infection of the general system, which is favored by an inefficiency of the function of the liver. The nervous system is particularly affected, as also the urinary, circulatory and respiratory systems.

Treatment.

Prophylactic Treatment.—A change of climate to the mountains or the seashore before the beginning of hot weather is the most efficient precaution that can be taken by those predisposed to diarrhœa, in frequent recurrent attacks, from old age, long-continued disease, and general debilitating influences. This precaution is particularly applicable in the case of infants and children.

One attack predisposes to a second, so that a strict hygienic and dietetic treatment, to be continued for at least one year, is to be enforced. The avoidance of intemperance in the quality and quantity of food, imprudent exposure to wet and to sudden changes of temperature is all-important. The knowledge of the diathesis of every individual case is of service in formulating advice as to diet, clothing, mode of living, etc.

General Rules of Treatment derived from a Knowledge of the Etiology of the Disease.—Where the cause is the ingestion of improper and indigestible foods, accompanied with paroxysmal pains, and infrequent, small stools, a cathartic, as castor-oil, or calomel gr. ij–v, sodium bicarb. gr. ij–v, followed by a saline purge, is to be given to expel the foreign substance, and thus lessen the time for fermentation and putrefactive changes, and further injury to the delicate mucous lining of the intestine.

All the forms of acute intestinal catarrh have a certain varying amount of gaseous formation, as shown by the tympanites and borborygmi, whose origin is explained by the fact that fermentation and putrefactive changes are occurring as a result of bacterial action upon the food; bacteria find their pabulum for multiplication in the decomposing substances. If we could reach these micro-organisms and arrest their activities, and remove the mucus and decomposing fluids, then we would accomplish earlier results and a quicker return to the normal state. That the intestinal canal is difficult or impossible to disinfect is due to our imperfect methods or to anatomical conditions, and not to the incorrectness of the theory of antisepsis.

In the cases where bacteria are the cause, indicated by the formation of gas, acid reaction of the fæces, and increase of indican in the urine with sulphuric ether compounds, with marked increase of bacteria in the stools, the administration of intestinal antiseptics, combined with or followed by a cathartic, is the nearest approach to disinfection that can be obtained. The requirements of an antiseptic employed are that it should be non-poisonous, insoluble in the stomach and very soluble in the intestine, and if possible it should emulsify with the fats and still retain its antiseptic properties; and the dose should be large and frequently administered. This is to be followed by a cathartic and strictly sterilized food, given during the period of illness. The antiseptic remedies used are principally bismuth salicylate gr. i–xv, every two to three hours, calomel gr. $\frac{1}{6}$–$\frac{1}{2}$ given every hour for five doses, bismuth subnitrate gr. x–xv–xxx, and salol gr. v. Benzo-naphthol gr. viij in powders, followed by occasional doses of calomel sufficient to purge slightly, has good results in many cases. The following formula may be used; excellent results have been obtained from it where auto-intoxication was evident:

℞. Benzo-naphthol., gr. ij (0.10);
Bismuthi salicylatis, gr. v (0.30);
Resorcin., gr. ij (0.10).
M. et. ft. in pulv. j.
Sig. One every three hours.

Followed by calomel gr. v with sodium bicarb. gr. v.

Resorcin, creasote, salicylic acid and naphthalin have been advocated as antiseptics. Beta-naphthol was warmly praised by Bouchard, as it quickly and effectually deodorized the stools, but is open to objection, as it is irritant to the stomach and reduces the secretion of hydrochloric acid. Benzo-naphthol is non-irritant and does not impair the gastric secretions, yet has all the qualities of the antiseptic action of beta-naphthol, and is therefore preferable. It may be given in doses of gr. iss–viij in powders, repeated every two or three hours.

Tanningen or diacetyltannin—gr. iv–xv, three times a day—is insoluble in the stomach; tannic acid is set free where the reaction is alkaline, and thus the active agent is brought in direct contact with the surface to be influenced.

Hayem recommends lactic acid in the form of a lemonade, composed of $\frac{1}{2}$ ounce of lactic acid, 7 ounces of simple syrup, and 20 ounces of water.

The most rational method of reaching the causative agents, namely

the bacteria and their products, is by rectal irrigations with antiseptic solutions by which the foreign substances are washed away, meteorism reduced, and the bacteria made inactive, leaving a clean surface of mucous membrane. The following antiseptics may be used in this manner in the strength indicated:

			Grammes.
Boric acid	ʒiss–ij	to the pint	(6.–8. to 500).
Creolin	gr. iv–viij	" "	(0.25–0.50 to 500).
Thymol	gr. iv–viij	" "	(0.25–0.50 to 500).
Tannic acid	gr. xxx–lx	" "	(2.–4. to 500).
Salicylic acid	gr. xv	" "	(1. to 500).
Naphthol	gr. iss–ij	" "	(0.09–0.12 to 500).
Potassium permanganate	gr. iss–v	" "	(0.09–0.30 to 500).
Carbolic acid	gr. v–x	" "	(0.30–0.60 to 500).

The first in the list is the safest and the last the least safe. Mercuric chloride is dangerous in any strength, and nitrate of silver is more adapted to the chronic form, particularly when ulcerations exist. Formalin, 1:10,000, has been used, but stronger solutions have proved too irritating to the bowel.

The irrigations should be continued twice daily. Should there be a lessening in the number of stools, in putridity, meteorism, and the amount of mucus, it is an indication for lengthening the intervals of treatment.

Treatment of Clinical Varieties.—The disease may be divided clinically into three forms, namely: I. Mild form. II. Moderately severe and Severe forms. III. Choleraic form.

I. Mild Form.—Even in the mildest form, when diarrhœa exists without fever, rest combined with fluid diet and the avoidance of solid food for twenty-four or forty-eight hours will shorten the attack and result in cure in a few days. Milk is most suitable in all cases, with the addition of lime-water, or diluted one-third with barley-water or Vichy water. After the first twenty-four hours the patient may take light beef-tea or thin broths. After the diarrhœa subsides we may give soups, a soft-boiled egg, gradually increasing to a solid diet. Should the diarrhœa continue and be accompanied with slight pain, bismuth subnitrate or salicylate may be given, combined with opium to lessen the number of stools and relieve pain, but not in doses sufficient to stop the movements too quickly.

The attack may be a simple duodenitis, the indications of which are pain with flatulent distention and subsequent icterus. The fæces have a penetrative odor, contain unaltered fats, and mucus is intimately mingled with the fluid stool. Strict attention to diet, avoidance of starches and solid foods as long as these conditions continue, will soon bring relief.

II. Moderately Severe and Severe Forms.—Where the

attack is more severe, attended with fever and with colicky pains and tenesmus, borborygmi, distention, and diarrhœal dejections that are soft, watery, and frothy from gases, the patient should be kept in bed and not allowed to rise to stool. Hot fomentations or sinapisms may be applied to the abdomen for the relief of the pain; afterward a flannel binder should be worn. Food should be abstained from during the first twenty-four or forty-eight hours, and small quantities of barley-water and rice-water given to relieve thirst; a little hot brandy and water may be given when the pulse indicates weakness. Then, after a day or two, milk should be given and persisted in until the diarrhœa has ceased; or, if pure milk is not tolerated, it should be diluted one-half with barley-water or rice-water. Expressed beef-juice may be given instead of milk, in small quantities at short intervals.

Internally bismuth subnitrate, gr. v–xx, with Dover's powder, gr. ii–v, or 5 to 8 drops of the deodorized tincture of opium, may be ordered to check the diarrhœa; or morphine, gr. $\frac{1}{4}$, hypodermically, to produce quiet and relieve pain. Opiates should be cautiously given in doses sufficient to diminish the stools gradually: too large doses would arrest peristalsis and thus increase the colic, fever, and catarrh. In case of nausea and vomiting the opiates may be given by enema, as tinctura opii, gtt. x, normal salt solution ℥ij; or in suppositories, morphia gr. $\frac{1}{4}$, ext. belladonnæ gr. ss, ol. theobromæ q. s.

Although the symptoms may cease after this course of treatment, yet the catarrh still persists and the normal anatomical condition of the mucous membrane of the intestine is not reached, so that a strict liquid diet is to be continued, gradually adding broths, soups, beef-tea, sweetbreads, meat jellies, and other solids of easy digestion, as improvement takes place. It must be urged that cold water is to be avoided, as are also fruits, fatty, farinaceous, and acid foods.

The seat of this form is chiefly in the ileum and colon—ileo-colitis—rarely in the ileum alone. If in the ileum alone, there may be no diarrhœa, but the presence of mucus disseminated in the dejecta as small hyaline mucous particles, with indican in the urine, are diagnostic indications. The same treatment is called for in this class of cases. Rectal irrigations, as suggested in the article on Dysentery, are advisable in this form, especially if the stools are putrid.

III. Choleraic Form.—Should the case be one more severe, where symptoms of collapse are imminent, as pinched expression of the face, emaciation, accelerated and small pulse, cool skin, cold sweats, cramps in the extremities, etc., with frequent liquid stools without color or odor, with much or little mucus, numbering twelve to twenty-four in twenty-four hours, accompanied or not with pain, tympanites, and tenesmus, the patient should have absolute rest in bed, not being

allowed to rise to stool; external heat is to be applied to the abdomen and body, a hot mustard foot-bath given, with hypodermic injection of morphine, gr. $\frac{1}{4}$, to stop the purging. If the patient be exhausted and cyanosed, hypodermoclysis or intravenous injection of normal salt solution (6 : 1000), one litre, should be given, also stimulants hypodermically and small quantities of iced cognac by the mouth. After the subsidence of the most dangerous symptoms, when the patient gradually recovers from the collapse, the free administration of water is first called for. Milk diluted is peculiarly efficacious in such cases, and the reason is no doubt to be found in the fact that it diminishes the number of bacteria in the intestine. Gilbert and Dominici have discovered that in men and the lower animals an exclusive milk diet will reduce the bacteria in the fæces to one-seventh of the normal. No solid food should be allowed until the stools are normal in character, milk being given exclusively.

The medicines used are principally bismuth subnitrate and opiates to relieve pain and reduce the number of stools.

In this as in the previous form, rectal irrigation with the antiseptics used for the purpose, as mentioned above, is of special service in reducing and aiding in the expulsion of the toxic substances formed in the intestinal canal, although in the acute stage the patient is usually too ill to permit of this treatment. The locality of this form of the disease is in the ileum and colon—chiefly a colitis—where the irrigations may be used with benefit, as they come in direct contact with the diseased portion of the bowel.

For the collapse, besides the restoration of water to the blood by intravenous and subcutaneous injection, it may be required to sustain the heart action with nitro-glycerin, strychnine, and whiskey administered hypodermically.

In infants and children acute intestinal catarrh is chiefly found in the ileum and colon, and is designated as ileo-colitis. The lesions are much the same as occur in the adult, and the duration of the illness depends upon the nature and extent of the process. The general prophylactic treatment, hygiene and dietetic, should be applied here as with the adult; the peculiarities to which children are prone, however, make certain special rules necessary.

Prophylaxis, regarded from an etiological standpoint, is the only way to the prevention of the disease. Children should have change of climate, especially in the summer months, and many lives may be saved by timely insistence on this point. Sufficient clothing, cleanliness of the body by bathing, changing of napkins, and washing of nipples and bottles will lessen the large number of cases. It is important to give children sterilized foods; milk sterilized is best—this should be given at regular intervals during the day, say every

two hours, and no food from 11 P. M. until 6 A. M.; in older children no food should be allowed from 10 P. M. to 7.30 A. M., in order to give the stomach and intestine the proper amount of rest and time for the digestion of the food previously taken. Regularity in feeding, in the quantity and quality of the food, bathing, fresh air, and sleep will add a great deal to the health of the child; overfeeding should be avoided. The presence in the stools of masses of undigested casein or the frequent vomiting of milk is evidence that, for the time being at least, the food is in excess.

In mild cases, where there is diarrhœa and vomiting with a slight rise in temperature, avoidance of all food for the first twenty-four hours is imperative; after which barley- or rice- or albumin-water, or wine whey may be given in small quantities, increasing the amount should improvement take place. Later diluted milk may be cautiously tried. If this treatment does not suffice, bismuth subnitrate, in doses suited to the age, should be given every two or three hours, and irrigation of the colon two or three times daily with a mild antiseptic or astringent resorted to.

Should the case be of greater severity, accompanied with pain, tenesmus, and vomiting, frequent and bloody stools, then the means already given are to be tried, with hot fomentations to the abdomen to relieve pain. Opium is not well borne by children, and therefore should not be used unless urgently demanded. Should the pain continue, deodorized laudanum may be given in appropriate dose to relieve tenesmus and lessen purgation. Rectal irrigation with cold or hot water is to be used twice daily, followed by tannic acid solution (ʒss to Oj) for its hæmostatic and astringent as well as antiseptic effects. Boric acid solutions in most cases fulfil the requirements without recourse to stronger remedies.

Where the case is very acute, associated with symptoms of prostration and frequent liquid stools, containing mucus, blood, or pus, then absolute rest, combined with careful feeding and with brandy or whiskey for the needed stimulation, hot fomentations to the abdomen, crushed ice to relieve thirst, and antiseptics by the mouth or by rectal irrigation, are measures to be employed.

When the child recovers sufficiently from the diarrhœa and accompanying symptoms, proper feeding at regular intervals is the principal matter for the physician's attention; his directions should be clear and precise, covering two weeks at least. Occasional irrigations of the colon once daily may be continued until the stools are normal and without mucus.

The dieting should be made a special study in children prone to such attacks, and the stools subjected to microscopic examination in order to detect any fault in digestion.

CHRONIC INTESTINAL CATARRH (CHRONIC CATARRHAL ENTERITIS; CHRONIC DIARRHŒA).

In the treatment of chronic intestinal catarrh with chronic diarrhœa much is dependent upon the stage and degree of the chronicity and upon the predisposing and exciting cause. It may be a distinct and primary disease or, as most commonly occurs, it is a sequel to frequent attacks of acute intestinal catarrh. The anatomical changes of the intestinal wall may involve all the coats; atrophic or hypertrophic condition of the mucous membrane may exist, and, with the other organic changes that follow a long-continued catarrh, there would be no possibility by treatment of securing a return of the structures to a normal condition. Nothnagel found in 80 per cent. of his cases an atrophic condition of the mucous membrane. Jürgensen, Blaschko, Sakaki, and others found changes in the nervous system, involving particularly the plexuses of Meissner and Auerbach, in this same form.

In cases where destruction of the epithelial lining takes place there results auto-intoxication from absorption of the products of the fermentation of carbohydrates and putrefactive substances from proteid decomposition by microbic action. Should the absorption of these toxins, toxalbumins, aromatic substances, and ptomaïnes be in excess of what can be gotten rid of by the liver and excreted by the kidney, then a number of varied symptoms occur involving the intestinal tract, as nausea, eructation, vomiting, diarrhœa, colic, etc., and the nervous system, as headaches, vertigo, insomnia, irritability, and depression of spirits. A reduced secretion of bile also predisposes to the increase of decomposition-products.

The presence of mucus in the stools is a positive indication of this pathological condition, and is found either within the fæcal masses or coating them, according to the location of the lesion in the intestine.

Treatment.

The best means for treating these morbid processes is by a strict regimen of diet suited to the individual's capacity; and without the ready concurrence of the patient in this treatment it is useless to attempt a cure.

Where the disease is due to long-continued, passive congestion of the portal vein, as in cardiac, pulmonary, hepatic, and nephritic diseases, or from debilitating disease, as tuberculosis, or as a sequel to typhoid fever or dysentery, then the treatment applied should be as the individual case demands for these conditions.

There are three forms of the disease that require somewhat different forms of treatment. It may be characterized (1) by constipation.

with the presence of varying amounts of mucus in the stools; (2) by occasional and recurring attacks of diarrhœa from catching cold or imprudence in diet; or (3) by constant diarrhœa.

(1) *Constipation* occurs most often in these cases, and is the rule in chronic catarrh of the colon, due not to any loss of the muscularis, as the muscular coat is intact, but probably to a reduced or lowered physiological function of the nervous system of the intestine caused by inflammation, and to increased density of the fæcal mass from deficient secretion. In this form the stools are composed of dry, dark, and crumbled scybala, or they may appear normal, covered externally with tenacious mucus or even with pus should there be follicular ulceration. Allied to this condition is abdominal distention, borborygmi, uneasiness and distress in the abdomen after eating, occasional cutting pains which subside after a movement, vertigo and præcordial distress, and increased sulphuric ether substances in the urine, all due chiefly to fermentative decomposition and auto-intoxication, which are partly relieved by the expulsion and eructation of gas. The treatment is principally by diet and intestinal antisepsis, combined with cathartics. Care as to proper hygiene, removal of any debilitating influences, as care and mental anxiety, advice against imprudent eating and drinking and other dissipations are necessary and should receive important consideration.

In these cases climatic treatment in a mountain region is better than at the seashore, high altitudes in a temperate or southern climate in winter being most desirable. Mental rest and diversion from all home and business cares may aid in the cure if continued for from several months to a year. Especially in cases complicated with hypochondriasis, melancholia, or neurasthenia, which are not rarely met with, is a prolonged residence in the mountains to be recommended in order to prove of permanent benefit. An abdominal binder should always be worn; moderate exercise, especially on horseback, massage, light gymnastic exercise, and warm baths with friction are advisable. The habit of going to stool at a regular hour every day is to be urged, and the stooping posture at stool is much to be preferred to the seated position of the ordinary closet. Indeed, a return to the primitive methods of defæcation is often curative.

Frequently this condition is accompanied with a decrease of the proper biliary and pancreatic secretions, so that the diet prescribed must be easy of digestion: this must take place chiefly in the stomach, leaving a minimum amount of intestinal work. Regularity in eating and the proper mastication of food is the first principle. The preferred articles of food are: rare, scraped beef, toasted bread, beef-essences, cocoa, light soups, boiled chicken, white meat of game, milk, which if not tolerated should be boiled, soft-boiled and raw eggs,

koumyss and matzoon, sweetbreads, and oysters. If the case be an obstinate one, then this diet should be restricted to fluids, returning to solids gradually as the condition improves. These patients should principally avoid cold drinks, acid or sweet foods, puddings, fats, pastry, and most starch foods, most vegetables and fruits either cooked or raw. Any unobjectionable mineral waters may be suggested, as they are both diuretic and diaphoretic, and, as a purgative is often required, the Bedford, Hunyadi, or Carlsbad waters may be used.

The medicinal treatment may be directed first to aid digestion, with pepsin and hydrochloric acid given after meals so as to diminish the work of the intestine. For constipation the various cathartics, as calomel, cascara, aloin, or podophyllin with belladonna and strychnine, can be given. It may be necessary to use enemata, which, given in small quantities and at the same hour every day, will in time re-establish the habit of defæcation.

(2) Frequently *constipation* and *diarrhœa* alternate, due to the irritation of the intestinal nervous system by scybala and the decomposing microbic products formed during constipation, or to slight changes in temperature, and indiscretions in diet. Care as to diet and clothing and avoidance of cold or wet, will be needed for the relief or cure of this form of the disease. The stools will show articles of food undigested, mucus in small lumps, disseminated in small fæcal masses and in fluid stools; at first these are formed and covered with tenacious mucus, afterward they are fluid and bile-stained. This class of cases often suffer with meteorism, pain, and nervous symptoms which abate after regular evacuation of the bowels. The general condition of these patients may be excellent for years, and only with imprudent exposures and taking cold do symptoms of diarrhœa arise, which soon cease after proper care as to hygiene and diet. Besides rest and diet and other measures to aid digestion and improve the general health, various intestinal antiseptics, as bismuth salicylate, salol, benzo-naphthol or resorcin, should be prescribed where symptoms of auto-intoxication are apparent.

(3) *Diarrhœa* may be the chief symptom; the stools may number from one to twelve in twenty-four hours. In the one case there may be from one to two stools every day of watery or semi-solid consistency; in the other case there may be frequent diarrhœal stools containing undigested food, mucus, and bile-pigments. The plan of treatment consists in the restoration of the nervous function and inflamed mucous membrane of the intestine to the normal. When borborygmi, persistent flatulency, and pain are frequent symptoms, milk diet should be persevered in for several weeks, and solid food, starches, and fats avoided; hot fomentations and rest in bed may be necessary to relieve the pain.

Antiseptic medication by the mouth and irrigation of the colon should be used for disinfecting the lower alimentary canal. All efforts are needed to improve nutrition by regulating the life of the individual, by careful exercise, strict regimen of diet, baths, massage, and appropriate change of climate. Sometimes partial or complete rest may be resorted to in order to check the continual drain of fluid movements. Opium, the routine use of which is to be condemned, is our only valuable remedy for intense pain, but should not be long continued. When the diarrhœa is checked by this treatment the disease is by no means cured, and the *restitutio in integrum* is only obtained by continuing liquid diet. Milk should be the principal article of food; alternating with this koumyss, matzoon, buttermilk, beef-juice, and some of the various prepared and predigested foods may be used. Return to solid foods should be delayed until some benefit is assured; after continual improvement for a month the most digestible foods may be added to this list, such as scraped and finely minced beef, raw or slightly cooked; soft-boiled eggs and oysters, each being added gradually to the dietary and its effect watched carefully. The disappointment in the treatment usually results from too early return to mixed diet after cessation of the diarrhœa.

Internal medication is of little value, yet various antiseptic remedies may be given to prevent fermentative decomposition, such as bismuth salicylate, benzo-naphthol, lactic acid, and salol.

The usual seat of the disease is the colon, so that much is to be expected from treatment by irrigation of the rectum and colon with astringents and antiseptics, as mentioned in the article on Acute Intestinal Catarrh. The method of irrigation is the same as described and employed in the article on Dysentery. Tannic acid, boric acid, zinc sulphate, and alum may be employed in this way in the strength of from 1 to 2 : 500. These should be used two or three times daily; the antiseptics are to be preferred to the astringent remedies mentioned.

Stimulants must be given in most cases, especially in old people or those having a sluggish circulation from organic disease. Strychnine and alcohol are the best forms of stimulant.

Where the inflammatory process continues to the ulcerative form of the disease—follicular ulceration—as recognized by emaciation, debility, anæmia, diarrhœal stools containing mucus, blood, and pus, with shreds of mucous membrane, everything should be done to improve and maintain the general nutrition with local treatment by irrigation of the lower bowel with antiseptics. The milder agents, as boric acid, are the best. A remedy for this purpose that will stimulate to healing, besides acting as a mild astringent and antiseptic, is silver nitrate in strength of gr. viii–xv to Oj.

In chronic duodenitis and chronic ileitis, the dietetic plan of treatment is most important. Foods most easy of digestion by the stomach and the avoidance of fats and starches are to be prescribed in order to minimize the work of the intestinal digestion.

In colitis the methods and remedies mentioned for irrigation are most appropriate and effective.

There is another class of cases in which the marked symptom is expulsion of membranous-like masses of mucus of various shapes and forms, some being moulds of the intestine. This is most often associated with neurasthenia and atonic dyspepsia, so that it may be said to be a symptom of disorder of the nervous system. It is sometimes found in association with floating kidney. The treatment in such cases would be to influence the mind of the patient by removing depressing influences: change of climate and residence to the mountains, camping out, exercise that pleasantly occupies the mind, electricity, special nutritious diet, tonics and aids to digestion are all necessary to influence this condition. Sometimes rest is of more benefit and, with attention to proper digestion, is all that is needed. Uterine and ovarian disorders should be remedied. This form of the disease, mucous colitis, occurs more frequently in women than in men and between the ages of forty and fifty years. When there is constipation, then the use of mild laxatives, as aloin, podophyllin combined with belladonna and strychnine, are to be preferred to drastic cathartics or salines. Water should be taken early in the morning and during the day, and a habit of going to stool regularly every day should be established.

ACUTE DYSENTERY.

More or less chaos exists at the present time on the subject of dysentery. The former symptomatic classification has been unsettled by the proved connection between the tropical form of the disease and the amœba coli; but as no parasite is uniformly found in the sporadic disease with so-called "dysenteric" symptoms, it is not possible to class all such cases under one specific form, or even to assert that they are all due to a specific cause. It is probable that there are various forms of dysentery from different micro-organisms, and there may be a non-specific form due to "catching cold" or to the presence of indurated faeces or foreign bodies, but on these points there is still much uncertainty. Fortunately the treatment that aims at destroying micro-organisms in the colon and rectum is so successful that, for the present, as far as the therapeutics of the disease goes, we may regard all cases as local infections to be treated as such.

The disease has its seat in the colon and rectum, where inflammatory changes occur involving the mucous lining, the tubular and solitary glands. Accordingly the symptoms are those of a very acute colitis, characterized by frequent stools with the discharge of blood, mucus, and pus, and accompanied with fever. Thus, in the treatment of the disease, accepting the microbic theory, the tendency is to apply the principle of asepsis and antisepsis, using remedies and methods that cause destruction or retard the further development of microorganisms in the colon and rectum. The older empirical or symptomatic methods are ceasing to be employed unless consistent with the prevailing views of the pathology and pathogenesis of the disease.

An attack of acute dysentery may begin with premonitory distress in the abdomen, occasional chills, and a feeling of general malaise; then follow the characteristic symptoms that mark the disease—namely, fever with more or less prostration, tormina, tenesmus both rectal and vesical, and mucus and bloody stools. A mild case may last from a week to ten days and have slight fever, tenesmus, and burning in the rectum, with frequent evacuations of blood-stained mucus. In the more severe form these symptoms are intensified, the stools becoming bloody or purulent, containing membranous flakes or shreds, or even moulds of the large intestine; there are vomiting and thirst, tympanites, tenesmus, and tormina, great exhaustion and profuse sweating, with delirium, the illness lasting two, three, or four weeks. The treatment must take into account the gravity of the case, measured by the height of the fever, the strength of the heart-beat, and the state of the circulation, the degree of prostration, and the character and frequency of the stools. When the stools are involuntary, painless, and fœtid, containing membranous shreds and pus, there is a more serious pathological process than when they simply consist of mucus, pure or blood-stained. Consideration as to the locality of the lesion, the presence of ulcers, putrid decomposition in the bowel and possible auto-infection from this source, and the probable existence of a microorganism in the intestine as the cause of the disease, must be taken into account when prescribing for these cases.

Treatment.

The preventive measures applicable to the treatment of dysentery are in common the same as those conducive to good health in general. Where there is a damp soil, imperfect drainage, overcrowding such as occurs in public institutions, imperfect ventilation, impure drinking-water, careless disposal of the excreta—conditions that are prejudicial to health and favorable to the invasion of the disease, the rules are plain as to what should be done to prevent the outbreak of dysentery, especially in an epidemic form. When an epidemic does occur, atten-

tion should be paid to public and individual hygiene: the disinfection of the excreta and the securing of pure drinking-water are essential. All drinking-water should be filtered and boiled, regardless of its source.

At the onset of the disease the patient should be put to bed and have absolute rest, and the bed-pan should be used from the first. The bed-covering should be sufficient to keep the feet and surface warm and to prevent chilling; good ventilation, strict cleanliness as regards the disinfection of the stools, clean bed-clothing and washing of the anal region with antiseptic lotion of carbolic acid, lysol, or creolin, after evacuation, should be insisted on from the beginning. Hot fomentations and poultices to the abdomen may give the patient a feeling of comfort and aid in relieving pain. The use of ice locally over the region of the colon would seem to be a rational means of reducing the intense hyperæmia of the earlier stages, but it has not been much advocated. Without care in treatment the mildest case may take on a severe course and the intensity of the symptoms increase from the destruction of tissues by necrosis and from the absorption of decomposition-products of microbic origin.

Diet.—Errors in diet, improperly digested food, and the fermentation and decomposition resulting therefrom, add much to the danger and to the gravity of the symptoms. Concentrated foods, easily digested in the stomach, as broths or beef-essence in small quantities, with rice-water and barley-water to relieve thirst, are best suited to these cases. Milk is sometimes not well borne, and the presence of casein in the stools will be an indication for its discontinuance. If milk be given, it should be diluted one-third or one-half with lime-water, barley-water, rice-water, or Vichy water, or it may be sterilized or peptonized. It should be given in quantities of from 2 to 4 ounces every two or three hours. There should never be any overloading of the intestinal tract with food. It is difficult to get perfect digestion; moreover the increase of the waste products would add to the irritation and to the possibility of auto-infection from any decomposition that may arise. Enough food should be given to maintain the strength of the patient, and as improvement takes place, recognized by the change in character of the stools and relief of pain, the quantity may be increased. Solid food should be withheld for some time, as increased peristalsis and additional waste products may cause the reopening of the healing ulcers.

Laxatives.—The use of laxatives is rational as applied to the disinfection of the intestinal canal, by removing contents that irritate mechanically, and which, by their retention, pave the way for putrefactive changes. The treatment of a case may well be begun by the use of a saline laxative, as magnesium sulphate, sodium sulphate,

sodium and potassium tartrate, or castor oil, especially where the stools are small and composed of scybala coated with mucus and blood. In children the use of calomel is to be preferred, especially when vomiting occurs. There must be sufficient dosage to obtain free watery movements with the least amount of irritation, as increase of peristalsis will, to a certain extent, be harmful to the already actively inflamed intestine. Where the stools are copious and fluid, and diarrhœa already exists, the use of purgatives, as a "method," may do much harm. If daily irrigation of the bowel is employed, there is rarely a necessity for repeating a cathartic, as the bowel is kept clean of any accumulation of fæcal matter and of decomposing fluids. If constipation sets in after the subsidence of the acute inflammation, a cathartic is necessary.

Opium.—Opium, if needed to diminish peristalsis and pain, should be given in small doses, but never in doses sufficient to arrest the movements completely or to check them too suddenly; the most sudden and even fatal collapse may follow the breaking of this rule. Especially is it to be remembered that opium is not to be given where the stools are liquid and putrid, as such accumulations are much better expelled. The use of irrigations of the lower bowel, as will be spoken of hereafter, will remove any danger of absorption of toxic substances and also lessen the number of stools. Where there is intense pain and insomnia, opium is of great value, and is best given in the form of morphine hypodermically; in this way its effects can be better regulated. It may also be given in the form of Dover's powders or deodorized tincture of opium. These should be given in small doses at safe intervals; the effects must be carefully watched so as to avoid all risk of narcosis.

Ipecacuanha has for a long time been held especially efficacious in cases with high temperature and intense tenesmus. Large doses of ipecacuanha are recommended by the Anglo-Indian physicians, but it has never met with favor in this country; some benefit is claimed when administered in quarter-grain doses every half-hour. No curative action can be looked for in this drug, and even the most enthusiastic supporters have less reliance in its action than formerly. Astringents are without effect and are harmful in that they derange digestion.

Large doses of **bismuth subnitrate** every three hours, during the day, have had beneficial effects at the hands of some physicians.

Intestinal antiseptics, as magnesium salicylate, bismuth salicylate, gr. x–xv, benzo-naphthol gr. v–x, may be used to assist in the disinfection of the canal, particularly where meteorism from decomposition is present. Calomel given in small doses and at short intervals has the combined action of an antiseptic and mild cathartic; Dover's

powder may sometimes be given during the course of administration of calomel; it will relieve griping and prevent too active action of the calomel. This treatment should be continued several days to be of any benefit. Corrosive sublimate in small doses, from gr. $\frac{1}{120}$ to $\frac{1}{60}$ every hour, has been employed for the same purpose.

Local Treatment of the Rectum and Colon by Suppositories, Injection, and Irrigation.—The ancients washed out the bowel for the removal of "acrid humors" which they thought intensified the inflammation. Pathological research at the present day shows us that the ancients were right, and that if we could keep the bowel thoroughly clean and aseptic, as we do an external wound, we would be better able to cure dysentery.

In 1826 Joseph Kent used cold-water injection, and O'Beirne first used the long gum-elastic tube, "to give exit to the accumulated and pent-up contents of the cæcum and colon." Hare, in 1849, said that the use of a long tube was like changing a huge internal abscess to an external one and enabled us to wash out and cleanse it from its putrid contents. He also stated that by getting rid of the acrid secretions resulting from sloughing ulceration, the use of local applications would diminish the terrors of dysentery. Hare also advises frequent repetitions of the process of cleansing whether the stools are solid or liquid.

As far back as 1774, the theory of antiseptic treatment was accepted. Peruvian bark, chamomile-flowers, calumba, charcoal, calcium chlorate, sodium hyposulphite, creasote, and other similar substances were necessarily employed. In 1879 Cantani recommended the local use of carbolic acid, sodium salicylate, sodium biborate, etc. for the disinfection of the colon in dysentery and prophesied good results from this form of treatment.

A number of reports since then have confirmed this prediction, and now the plan, in some form or other, has come into use in all countries.

Various methods have been adopted, all of which have the same end in view, being designed to act locally upon the inflamed surface:

1. Treatment by suppositories and by small injections.

2. Treatment by large injections which are retained and are passed by the voluntary effort of the patient.

3. Treatment by lavage with large quantities of fluid, the immediate escape of the fluid being provided for.

1. *Suppositories.*—It is plainly seen that in the use of suppositories containing astringents the action is purely local and is probably at most only applicable in rectitis. Suppositories containing opium or morphine may be beneficial in relieving the tenesmus. When used in this way the rectum should be first irrigated and cleansed of mucus.

Antiseptic remedies may be used in suppositories alone or combined with opium. Cocaine has been used in suppository form, but has not acted as efficaciously as might be expected from its antiseptic effect upon mucous membrane.

The use of *small injections* has a limited field, except for the cleansing and evacuating of the contents of the rectum. Starch-water and laudanum may be given in this way, but only after the use of the first-named injection; the dose should not be sufficient to cause a general physiological effect of the opiate, a mere local action to relieve tenesmus being desired. These methods are not mentioned with approval.

Solutions of silver nitrate, containing gr. $\frac{1}{2}$ or gr. $\frac{1}{4}$ to the fluid-ounce, together with 5 to 10 drops of deodorized tincture of opium, not more than from ℥j to ℥ij being used at a time, are serviceable where the inflammatory area can be reached by these low injections and when it is not of an intense degree. Small injections of astringents or of ice-water or the introduction of small lumps of ice into the rectum have been recommended, but with some these measures have seemed to increase instead of decrease the inflammatory process. The application of stronger solutions of antiseptics and astringents is better adapted to chronic dysentery.

2. *Injections of large quantities* of water, containing astringents or antiseptics in solution, are employed to bring the drug in direct contact with the inflamed surface to be treated, both for the purpose of cleansing and of disinfecting the canal. The selection of the apparatus and also the method of its application are important. The tube to be used should be about twenty-four to thirty-six inches in length and No. 27 English (No. 41 French) in size; it should be flexible, and fenestrated on the sides, the openings being smooth and large; an opening on the end is worse than useless. The fluid to be used is to be introduced from a fountain or Davidson's syringe, or may be poured into a funnel attached to the end of the tube. This should always be done under low pressure and slowly, in order that the fluid may have time to distribute itself beyond the point of entrance. This will avoid the danger of overdistention and possible rupture of the thin-walled intestine when ulceration has occurred.

The question arises as to how far the tube should be introduced into the rectum—if it should go beyond the curve of the sigmoid flexure. It is very difficult to pass a tube beyond this point; it almost invariably turns on itself. Perseverance to this end would attain nothing, and there is danger of forcing the end of the tube through an ulcerated bowel into the peritoneal cavity. The fluid thrown into the rectum and sigmoid flexure will reach the colon. I have had the opportunity to demonstrate the facility with which this

takes place, in the case of a fæcal fistula in the cæcum following an operation for appendicitis. Colored fluid was forced into the rectum with a Davidson's syringe, and, under gentle pressure, escaped in half a minute through the fistulous opening in the right iliac region. Frequent repetition of this experience has proved, beyond doubt, that fluid introduced into the rectum attains the same result, as when the tube was made to reach the colon. In the case of an artificial anus in the upper third of the descending colon, due to malignant disease, the same facility of colon-irrigation was demonstrated.

Various mineral and vegetable astringents are employed by this method, the antiseptics being found more serviceable when used by irrigation. The rationale for the use of astringents is found in the resulting contraction of the injected blood-vessels, but they have no effect upon the disintegration of tissue nor upon the decomposition that is going on in the intestinal canal. For this purpose alum, lead acetate, and tannic acid are used, in strengths varying from 1 to 4 parts to 500 of warm or cold water. Silver nitrate is very much used, particularly where the ulceration is extensive. Tannic acid is especially advocated by Cantani, not only for its astringent properties but also as an antiseptic, and because it combines with the ptomaïnes and forms insoluble, harmless tannates. When using this method the need of injection under slow pressure is to be emphasized. The patient should lie on his left side, with the hips raised; the fluid should remain in the intestine five, ten, fifteen, or twenty minutes.

The favorable indications for continuance of the treatment will present themselves at once, the stools becoming less frequent, the foul odor, mucus, blood, and pus will disappear, and the fever and general symptoms improve. Where relapses have occurred after discontinuing this plan of treatment, return to it has soon brought relief and a termination of the disease.

Dangers from this form of treatment are the over-distention of the bowel and the possible retention of a large amount of fluid. In the first case there would be risk of rupture of the bowel as already stated, and the tormina will be increased by stretching. The object of ridding the bowel of decomposing fluid and its disinfection is not accomplished and the source of auto-infection is not removed by injection.

3. *Irrigation or Lavage of the Intestine.*—This form of treatment differs from the injection method in that the return flow of the fluid is provided for, and thus the bowel is emptied of its decomposing contents and the diseased surface kept clean, as an external wound would be under antiseptic methods.

A large flexible tube, No. 27 English (No. 41 French) in size, can be used for this purpose. It should be introduced high into the rec-

tum and the water or solution allowed to flow in. When about six or eight ounces of the fluid are introduced it should be allowed to escape. In this way the process can be repeated indefinitely, until the return is perfectly clear; usually not more than from two to four quarts are necessary. This has the advantage over the method already mentioned, in that it is less painful and obtains better results.

Two soft-rubber tubes may be used, passed side by side into the rectum, one for introducing the fluid (No. 17 English or 29 French in size) and the second two sizes larger being for the free outflow. The syringe should be attached to the smaller of the two and the fluid gently forced in. A current is soon established, and if this procedure is continued long enough considerable débris of membrane, fæcal matter, and blood and pus will be washed away. The returning fluid will be stained for some time, showing that not only is the rectum but also the colon being washed and cleansed of its contents.

Results obtained from this treatment show a lessening in the frequency of the stools; the character of the stool changes, putridity disappears, and the blood and pus diminish.

A cardinal point on which I have insisted in dysentery is that the rectum is like an over-distended bladder discharging its overflow, the contracting and irritable sphincter retaining a large residuum of decomposing fluid. The irrigation method removes this accumulation, evacuates the bowel and acts upon the causative agent of the disease. Marked benefit, reached in a short time, especially follows where there is extensive ulceration with large, foul-smelling stools, fever, tormina, and tenesmus. Such result could not be obtained by any other form of treatment. If the sphincter is irritable and the tenesmus great, one may follow the use of the irrigation with $\frac{1}{2}$ grain of the aqueous extract of opium in suppository. As improvement takes place this may be omitted except to quiet nervous irritability or induce sleep—for which purpose, though, the subcutaneous injection of morphine gr. $\frac{1}{8}$ to $\frac{1}{4}$, combined with atropine gr. $\frac{1}{150}$ to $\frac{1}{120}$, is more satisfactory.

The water used for irrigation should be about 100° F. and a sufficient quantity allowed to enter and escape until the returning fluid is clear; about two to four quarts usually suffice. The frequency of its use depends upon the severity of the case; ordinarily from two to six irrigations a day may be enough, intervals to be increased as improvement takes place; but when there is evidence of much ulceration, as recognized by the discharge and symptoms, the irrigation should be as frequent as every three hours.

Antiseptics are used by irrigation for the purpose of retarding the action of the micro-organisms, but more effect is obtained by the frequency of the irrigation than by any ascribed disinfecting quality of the drug used. Boric acid (5 to 10 : 500) is the safest and best; tan-

nic acid (1 : 500), salicylic acid (1 : 500), carbolic acid (1 : 2000), or naphthol (1 : 4000), are used in solution in the strength indicated. Hydrogen dioxide or salt may be used without any danger. Corrosive sublimate is dangerous, no matter in what strength it is used, as retention of the fluid may occur and poisoning follow. Osler has obtained good results from the use of quinine (1 : 5000 or 1 : 2500 or 1 : 1000), claiming that it rapidly destroys the amœba coli.

The astringents already mentioned may be specially and advantageously used by irrigation when the intensity of the symptoms has abated and the stools are more diarrhœal in character, or when the tendency of the disease is to become chronic. For continued ulceration, silver nitrate is particularly adaptable, stimulating the ulcers to heal; it is mildly antiseptic and astringent.

Continued experience with treatment by irrigation as here described, and the reports of the success of the method when employed by others have added to my faith in its value. The failure to obtain good results is due to improper or imperfect methods in carrying out the plan suggested or to a lack of perseverance.

Further treatment of the patient is symptomatic. For sleeplessness and pain, tormina and tenesmus, the use of morphine hypodermically is the only satisfactory remedy, and should be employed according to the absolute needs of the case, with the precautions already given. For pain in the abdomen, hot fomentations or poultices are often grateful to the patient. Measures for supporting strength and preventing failing action of the heart are a concentrated diet and stimulants, as brandy, ℥ss, every two hours, or strychnine, gr. $\frac{1}{60}$ to $\frac{1}{30}$, every six hours, or tincture of digitalis, gtt. v–x, or nitroglycerin, gr. $\frac{1}{100}$, every three to six hours. Solid food should be forbidden for some time, and liquid diet continued until the subsidence of all symptoms.

CHRONIC DYSENTERY.

This condition follows an acute attack; there is a chronic flux due to the persistence of unhealed ulcers. An imperfect cure often results from imprudence in eating and unwise management in convalescence. Severe attacks with deep ulcerations often lead to it. The delicate cicatrix which has formed may break down, when reopening of the ulcers occurs. These ulcers may vary in position, size, and number. There may be but one, or the whole colon may be studded with them, with intervening ridges of thickened tissue of polypoid formation as described by Woodward. The intestine is

uniformly dilated or contracted, or irregularly dilated and contracted. In the amœbic dysentery, amœbæ may be found in the contents of the intestine, in the walls of the intestine, or in abscess of the liver due to an embolic process.

The symptoms are frequent fluid or semi-fluid stools, containing mucus, blood, and pus in variable amounts; the stools may be lienteric and in other respects may resemble chronic diarrhœa. Borborygmi and tympanites accompany the diarrhœa, the appetite is variable, the tongue is red and glazed, and disordered digestion and hectic fever add to the debilitated condition. Emaciation and anæmia are extreme from innutrition. Occasional acute exacerbations occur, and the patients waste away and die from exhaustion or from one of numerous complications.

Treatment.

The best prophylactic measure is the care of convalescents from acute attacks. Too early exercise and the return to regular routine in life are to be delayed. A liquid diet, rest, and proper hygienic measures must be continued for months after severe acute attacks. When relapses occur the same measures and caution are to be adopted as in the original illness.

Change to a cool, dry climate, and rest from physical and mental strain, in those much weakened, are often necessary. When recurring attacks are frequent, prolonged rest in bed with attention to diet, in combination with other treatment, becomes imperative.

Diet.—Unless there is strict regulation of the diet, acute exacerbations may occur or the stools may increase and become bloody and purulent. For the capricious appetite and disordered digestion milk is best suited; peptonized milk or koumyss may be tried, and should be continued for several weeks; beef-juice, buttermilk, and matzoon may be alternated with these, and, as improvement takes place, concentrated animal broths, raw or soft-boiled eggs may be added gradually to the regimen of diet. Several months should elapse before a more mixed diet is given, and when begun should be of the most digestible foods, as raw oysters, raw scraped beef, chicken, sweetbreads, bread, rice, or other farinaceous foods.

Aids to digestion are especially needed: pepsin and dilute hydrochloric acid may be given after meals. Tonics, as iron, quinine, and strychnine, may prove of benefit, but relatively are of little value.

Where tympanites and evidence of decomposition from intestinal indigestion occur, then various intestinal antiseptics, such as bismuth salicylate, magnesium salicylate, benzo-naphthol, and others, may be of use. Attention to diet and rest, together with rectal irrigation, will bring about the best results attainable.

Irrigation of the Rectum and Colon.—The irrigation should be used as described for Acute Dysentery. Silver nitrate, in the proportion of gr. v–x to the pint, is the best remedy for persistent ulcers. When the ulcers are in the rectum and can be reached, local applications of a strong solution of silver nitrate, or pure nitric acid, should be used through a speculum, previously cleansing the surface by irrigation with water; after the application the rectum must be washed out with salt or bicarbonate-of-soda solution according to the remedy used.

THE INTESTINAL PARASITES.

By H. A. HARE, M. D.

Although many different forms of parasites have been found in the alimentary canal of man, there are only three varieties commonly met with in medical practice in this or other countries. Of these we find the tape-worm in its various kinds, the round worm, and the so-called thread-worms. The tape-worm (or *tænia*) and the round worm (or *ascaris lumbricoides*) are found in the small intestine if in their normal habitat, while the thread-worms (or *oxyuris vermicularis*) are inhabitants of the rectum. In addition to these common parasites we rarely meet with the *anchylostomum duodenale* and the *trichocephalus dispar*.

The tape-worm occurs as the *tænia mediocanellata*, which nearly always finds entrance into the body by reason of the eating of raw or imperfectly cooked beef; the *tænia solium*, which is usually found as the result of using raw pork; and the *bothriocephalus latus*, which finds its entrance into the alimentary canal by the patient having eaten raw fish infested by this parasite in its cystic stage. The latter worm is exceedingly rare in America, but the others are quite common, particularly the tænia solium, which is sometimes called *tænia saginata*. In addition to these worms we more rarely meet with the *tænia cucumerina*, which is the parasite often found in the intestine of the dog, and the *tænia flava punctata*, which has only been found as a parasite of man two or three times, although it is a frequently found parasite of the common rat. The *tænia nana* is equally rare.

Before discussing the treatment of a patient suffering from worms in the intestinal canal, the diagnostic facts in connection with intestinal parasites must be recalled. In the minds of the laity the fact that a child is nervous and irritable, picks its nose, or has running at the nose and eyes is "a sign of worms." Itching of the anus is another symptom regarded by the laity as an infallible diagnostic sign. It seems hardly necessary to point out that there is nothing pathognomonic in such symptoms, and that, while these symptoms may be present as a result of, or along with, the development of intestinal parasites, they are also manifest in full force in children who have chronic or subacute gastro-intestinal catarrh and are not infested by worms. The

only positive diagnostic point in deciding that worms are present is the discovery of a segment of the tape-worm or its eggs, or a round or thread-worm, in the stools; and this may, in the case of the round worm, really indicate that the patient has been freed from his parasite. On the other hand, it must be remembered that the round worm occurs in numbers rather than singly, and therefore the passage of one is a fairly reliable sign of others being present and justifies the use of an anthelmintic.

Aside from these facts in connection with diagnosis it must not be forgotten that tape-worm is capable of causing a more or less well developed anæmia; and a history of the ingestion of meat of doubtful character should cause a careful watching of the stools for segments and for the eggs, which are often passed in great numbers. These eggs should be sought for by the microscope or a powerful magnifying-glass, as they are very small. They are round and covered with a hard shell, which can be broken, and which, when broken, reveals a few hooklets. The egg of the tænia solium is slightly smaller than that of the tænia mediocanellata. The eggs of the bothriocephalus latus are very large, oval, light brown in color, and very easily broken. As the segments of the bothriocephalus latus are rarely shed, and as it is the form of tape-worm which produces the grave anæmia, just mentioned, in the majority of cases of parasitic anæmia, an examination of the fæces for its eggs is very important.

If the round worm be the parasite, it may on rare occasions crawl up into the stomach and be vomited by the patient; but this is a much more uncommon occurrence than charlatans and hysterical malingerers or insane persons would have us believe.

Treatment.

A very large number of remedies have been given for the removal of both the round worm and the tape-worm, but there are only a few which can be regarded as entirely reliable, and these will fail to produce the desired results if the physician administers them without taking certain precautions as to the time of their administration, the diet of the patient, and the treatment which is to follow the use of the anthelmintic.

After it has been decided that a vermifuge is needed the patient should take no food after his ordinary evening meal, and the next morning, before any nourishment is taken, the dose or doses of the anthelmintic should be given, and be followed every fifteen or twenty minutes by calomel in the dose of one or two grains until about 10 grains have been taken. From half an hour to an hour after the last dose of calomel and three or four hours after the last dose of the anthelmintic, a full dose of some saline purgative should be adminis-

tered, or in its place castor oil should be given in sufficient quantity to ensure a free movement of the bowels. Each movement of the bowels that takes place should be carefully inspected to discover whether any worms have been dislodged, as the diagnosis that the patient is a sufferer from worms cannot be considered as absolutely proved until a worm or some portion of a worm is expelled. In the case of the tape-worm the patient cannot be considered as relieved permanently unless the small head of the worm is discharged from the bowel; many feet of segments may be passed with only temporary relief to the patient, because the head of the worm has not been dislodged and will soon develop segment after segment, which will rapidly take the place of those which have been discharged. Whether the case be suffering from round worm or tape-worm the careful physician will also see that the patient receives immediately after the action of the purgative medicine a copious rectal injection of salt water in order that the bowel may be thoroughly washed out, and, in this liquid, when it is expelled from the bowel, there will be found quite frequently additional worms to those freely passed, particularly if the patient has suffered from the ascaris lumbricoides. If the tape-worm has been the infesting parasite the head will perhaps be washed out of the bowel by this means, and, as this worm is usually found singly, the passage of a head is a fairly certain sign of cure.

The remedies which we have mentioned as being the best for the removal of the *round worm* are santonin and spigelia. Santonin itself should always be employed in preference to the santoninate of sodium, which because of its solubility may be absorbed from the stomach or the upper portion of the small intestine before the worm has been seriously poisoned by it. The result of this absorption is that the patient experiences the full physiological effect of the drug and the worm is but slightly affected by the medicament; whereas, if santonin is given in its crystalline form, without being powdered, it is dissolved and absorbed so slowly that it comes in contact with the worm in full strength and speedily poisons it.

The dose of santonin for a child of five or six years is 1 to 2 grains, preferably given in capsules or in a troche. The dose for an adult is 4 to 5 grains, or as much as 8 grains may be given, but the latter amount is perhaps slightly beyond the line of safety and if administered should be followed within two or three hours at the most by a freely acting saline cathartic which will sweep it from the bowel before a sufficient quantity can be absorbed to seriously affect the general organism.

Spigelia is equally effective with santonin and is the safer drug of the two. Its fluid extract may be given under the conditions that we

have named in the dose from 1 to 2 drachms to a child, or, if an adult is affected, in the dose of 2 to 4 drachms. Very frequently it is advisable to combine this fluid extract with an equal quantity of the fluid extract of senna, since this mixture not only makes the worm let go its hold, but also moves the bowels and sweeps the parasite from the intestine before it can recover from the effects of the poison. Although spigelia when taken in overdose produces symptoms almost identical with those of belladonna, and although the symptoms may at times be quite alarming, it cannot be considered a very dangerous drug from a lethal point of view.

For the removal of the *tape-worm* there are three remedies which should always be preferred to all others, namely, pelletierine, the active principle of pomegranate, the oleoresin of filix mas or male fern, and that homely, but nevertheless efficient remedy, pumpkin-seed. We have named them in the order of their value. The pelletierine is always employed in the form of the tannate of pelletierine, the dose of which is from 3 to 5 grains, and practically the only preparation of pelletierine which is employed is that of Tanret, in which the alkaloid is put up in a syrupy solution in small bottles each of which contains one dose. The drug when absorbed, after being given in overdose, is capable of producing symptoms of serious poisoning due to paralysis of the peripheral ends of the motor nerves. When a full dose is given the physician should take care that the patient is freely purged within two or three hours afterward. The small size of the dose, the fact that it is not disagreeable to take, and the extraordinary power which pelletierine has in the poisoning of the tape-worm render it by all odds the most valuable anthelmintic for this form of intestinal parasite that we have.

On the other hand, it cannot be denied that aspidium or filix mas or male fern, as it is variously called, is also a very efficient remedy for the removal of the tape-worm. The dose of the oleoresin should be ½ to 1 fluidrachm, given in small capsules, great care being taken that the patient is starved for a number of hours prior to its administration in order that the worm may not be protected by the presence of food and drink in the stomach and bowel, which will dilute the poison so that it is almost harmless to the worm. This remedy also should be followed by an active purgative, preferably one of the salines. It is a noteworthy fact that castor oil has been found to so increase the absorbability of the oleoresin of filix mas as to distinctly increase the danger of poisoning by this substance when it is given. Oily purges should therefore never be given when male fern has been used for the removal of tape-worm.

Pumpkin-seed, or as it is officially called, pepo, is often obtainable when these more refined anthelmintics cannot be had. The outer

coverings of the seeds should be removed and the remaining portion rubbed up into an emulsion, or be made into a paste which can be formed into an electuary by the addition of sugar. The dose of the seeds deprived of their outer coverings should be, for an adult, two ounces, and their administration should be followed in two or three hours by an active purgative. The large bulky doses necessary when pepo is used for the removal of tape-worm renders it disagreeable to most patients.

Thread-worms may be removed from the rectum by directing the patient's nurse or attendant to give a mild purgative followed by a copious injection of salt and water, or soap and water, to thoroughly cleanse and empty the bowel of fæcal matter. Immediately after this is done the rectum should receive by injection from a half to one pint of a decoction of quassia made by placing an ounce of quassia-wood chips or powdered quassia-wood in one and a half pints of water, and boiling it down to one pint. The patient should hold this injection for some minutes before passing it. If the bowel is thoroughly cleansed so that the worm is not protected by fæcal matter or mucus a very few such injections, given at several days' interval, will be most efficacious. Thymol solutions, and turpentine enemata of the strength of 1 drachm to the pint of soap and water, are also useful.

The *trichocephalus dispar* is so harmless that its presence is often unknown. It causes practically no irritation, but if it is to be removed copious quassia injections should be given.

The most important of the rarer forms of intestinal parasites is the *anchylostomum duodenale*, sometimes called *uncinaria duodenalis*. This parasite is usually found chiefly in the jejunum and is much smaller than either the round or tape-worm, the male being from 6 to 10 mm. and the female from 10 to 18 mm. in length. Although this worm is so small, its presence in the intestine in large numbers results in the speedy development of a profound anæmia in the patients infested by it. Indeed, the anæmia may be so severe as to result in death, and in Europe where the parasite has been spread by the employment of Italian and Polish laborers this form of intestinal parasite is not by any means rare. Infection usually occurs through the water-supply. It having been decided that the patient suffers from this form of intestinal parasite care should be taken that he does not infect others by depositing parasites in any place where they may infect the water-supply.

The diagnosis of infection by the anchylostomum duodenale can seldom be made by finding it in the fæces, for it rarely is discharged unless poisoned by drugs. The fæces always contain, on the other hand, large numbers of the eggs, which should be sought for in all

cases of persistent anæmia with a history of exposure. These eggs occur as unsymmetrical, thickly covered globules, and if the stools be placed in a warm spot the embryos can be seen to develop in the eggs.

The patient infested by the anchylostomum duodenale should receive full doses of thymol, as for example 30 grains in a cachet early in the morning and 30 grains two hours later, these two doses being followed in two hours by an active purgative. It is claimed that thymol is an absolute specific for the destruction of this parasite.

THE MODERN TREATMENT OF DISEASES OF THE SKIN.[1]

By H. W. STELWAGON, M. D.

Introductory Note.

Ointment Bases.—A few preliminary remarks as to the various ointment bases in common use will probably be of value to the general worker, and may be necessary for a clearer understanding of the remedial applications to be referred to in connection with individual diseases. The several ointment bases may be used more or less interchangeably, or they may be used in combination or mixture.

Lard—of good quality, fresh, properly prepared, and slightly benzoinated—is still a base for ointment which has not been supplanted.

Cold cream—unguentum aquæ rosæ—is an excellent base and may often be employed in place of lard, and is especially useful when a cooling effect is desired. Certain skins will admit of ointment applications only when made up with this latter base.

Petrolatum, or its variously named trade substitutes, has the great advantage of remaining free from rancidity, but it is not so softening as lard, or even cold cream, remaining more upon the surface as a thin coating; it is not agreeable, and may be even irritating to some skins. An ointment made with petrolatum will sometimes disagree, whereas the same medicament incorporated in lard or cold cream or mixed with another base will have a favorable effect. It is an especially cleanly base for ointments for the scalp.

Wool-fat, under the names of lanolin, agnine, adeps lanæ, etc., is

[1] Many remedies and some methods which have found space in the advertising columns of current medical literature during the past few years will not be found in this chapter: some for the reason that experience has demonstrated their unworthiness, and some for the reason that as yet their claim to be considered valuable has not been conclusively shown. In the pages at disposal it has been deemed to the best interests of the reader that the treatment of the principal diseases—diseases in which there had been probably some changes or additions in the therapeutical managment—be here presented from my own point of view and experience, which necessarily has assimilated much that my colleagues in dermatological work have found valuable. In addition, a number of the rarer diseases not considered in the former volume are briefly described, with the object of making the presentation of the subject of cutaneous diseases, as reflected by the entire work, as complete as space will allow.

sometimes used with advantage. It takes up a great deal of water, is alleged to have special penetrating power, and to be grateful to most people. It is somewhat stiff and tenacious, and should have incorporated with it 25 to 50 per cent. of petrolatum or 10 to 20 per cent. of some bland oil, such as the oil of sweet almond. It is somewhat questionable whether there is any superiority in a base so compounded over simple lard, petrolatum, or cold cream mentioned above.

When prescribing ointments which are to contain a proportion of liquid, it is advisable to have them made up with prepared suet or with simple cerate or lanolin, either entirely or partly depending upon the amount of liquid used.

In the following pages, when no special ointment base is mentioned it may be inferred that any of the first three named—lard, cold cream, or petrolatum—or a mixture of two or three—may be indifferently used, remembering that, when a penetrating effect is desired, lard or equal parts of lard and lanolin, or lanolin with a proportion of bland oil, should be prescribed; if mainly a protective action is sought, then petrolatum should constitute the greater or entire part of the base, with a proportion of wax or simple cerate to stiffen it if necessary; if a softening and cooling effect, then cold cream is the most efficient ointment base, with or without a small proportion of wax, according to circumstances. There are many other bases which may be used, but these several constitute the most valuable and are those commonly employed.

ACNE.

The modern treatment of acne places great stress, and very properly, upon the value of bodily exercise, especially out-door exercise, and careful attention to diet. All indigestible foods and stimulating drinks should be avoided. The bowels should be kept regular, with salines or vegetable laxatives, preferably the former. The patient's general health is to be rigidly examined into, and any other disease or faulty condition corrected. As the digestive system is mostly at fault, this should receive special attention. There are no specifics in this disease. At times it would seem as if calx sulphurata, in small doses, $\frac{1}{20}$ to $\frac{1}{2}$ grain thrice daily favorably influenced the pustular type, and that arsenic was occasionally of benefit in the sluggish papular variety. Ergot may be prescribed where atony of the muscular fibres of the skin is suspected. In cold, sluggish, indurated, and deep-seated types, more commonly seen in strumous patients, no remedy is comparable to small, continued doses of cod-liver oil.

Ichthyol, which has been greatly extolled, in doses of 3 to 15 drops three times daily, is of more than questionable value. Minute doses of bromide of arsenic, $\frac{1}{100}$ to $\frac{1}{50}$ grain three times daily, may be tried in obstinate cases. Small doses of corrosive sublimate and small doses of Donovan's solution seem to be of value in some cases in which sluggish, deep-seated suppurative action is pronounced.

Local treatment of acne is almost indispensable. The applications are usually made at night. Certain preliminary and concomitant procedures are, however, to be advised if a full effect of the local remedies is desired. The face is to be washed thoroughly with soap and water, rinsed carefully, and then sponged with hot water or steamed. It is then to be rubbed dry, with a pinching and kneading so as to obtain the favorable influence of massage also. The blackheads, or the most conspicuous of them, should be pressed out by means of the finger-ends or an instrument made for this purpose. The pustules may be advantageously opened and the pus ejected, the life of such lesions being much shortened in this way. Subsequent to these several preliminary measures the remedial application is made. If this latter is in the form of a lotion, it is to be thoroughly applied, so that if it contains a sediment a good deposit of the same will be left on the face. If the remedy has been incorporated in an ointment, a small quantity is placed on a piece of flannel and somewhat vigorously rubbed into the skin, afterward wiping off the excess. The application is to be allowed to remain on over night. In the morning the ordinary toilet washing is usually sufficient to remove what is left of the preceding night's medication. If the patient has decided to give himself over to treatment for a short rather than a longer time, the procedures of the night before may also be adopted in the morning. Ordinarily, however, patients prefer to dispense with morning applications. If after a few nights' use of the selected method a slight degree of irritation has been brought about, a mild dusting-powder of boric acid may be used after the toilet washing in the morning. If the irritation so produced should become very noticeable, or a mild exfoliation of the skin show itself, the treatment is to be discontinued for one or more nights and then resumed. In sluggish cases or in those cases desiring a rapid effect, instead of using a plain toilet soap the tincture of green soap may be substituted. If one remedy fails to bring about any improvement, or should the improvement cease, then another remedy is to be selected. Frequently a certain remedy or combination will benefit materially for a while, and its subsequent continued use fail. After substituting another remedy or combination for a time, recourse may often be had to the original treatment with again similarly favorable results. It is difficult to say in a given case whether ointments or lotions will prove the more satisfactory method

of treatment. Those having harsh and rather irritable skins will, as a rule, do better on ointments. The two methods, however, may often be usefully combined, first applying the lotion, allowing it to dry in, and then subsequently rubbing in the ointment; or they may be used on alternate nights.

The several external remedies most in vogue to-day are sulphur, resorcin, ichthyol, mercurials, and boric acid. Of these the most valuable by far is sulphur. It is used either in ointment form, 30 grains to 2 drachms to the ounce, or in the form of a wash. There are several sulphur washes which may be commended. One containing 2 or 3 drachms of sulphur, 10 to 20 grains each of camphor and tragacanth, and lime-water to make up four ounces—known as Kummerfeld's lotion—is often serviceable. Another with the same quantity of sulphur, and 4 drachms of ether and sufficient alcohol to make four ounces, is also a common prescription. By far the most valuable is a combination of zinc sulphate and potassium sulphuret, each $\frac{1}{2}$ to 2 drachms, to four ounces of water. Another of value is that known as Vleminckx's solution or liquor calcis sulphuratæ. This is to be used diluted with several parts of water, gradually lessening the proportion of water. Resorcin is employed in solution or ointment form, of the strength of 5 to 30 grains to the ounce. It may be advantageously prescribed in a compound prescription, made of a saturated boric acid solution, with 5 to 30 grains of resorcin, and 5 to 10 grains of zinc sulphate to each ounce. Ichthyol is of value in some cases; it is applied in aqueous solution or ointment, 5 to 25 per cent. strength. It may frequently be combined with sulphur in ointment form. Of the mercurials the oleate of mercury, corrosive sublimate, and calomel are the most valuable. Corrosive sublimate is prescribed as a lotion, $\frac{1}{2}$ to 2 or more grains to the ounce, and may often with advantage be added to the compound resorcin lotion already referred to. The oleate is used with an ointment base in 3 to 20 per cent. strength. Boric acid is extremely mild, but is useful in some cases. It is employed as a lotion, or more frequently the solution is used as the basis of a compound lotion. A lotion of this kind with 20 to 30 grains each of calamine and zinc oxide to the four ounces constitutes an excellent application for actively inflammatory, hyperæmic, or irritable cases, and is also useful when active remedies are temporarily suspended.

A plan of treatment which may be highly commended is that in which the skin is put slightly on the stretch and gone over somewhat roughly with a dull-edged curette. The tops of the lesions are in this manner scraped off and many of the blackheads forcibly expelled; hot-water applications should be immediately made to encourage the bleeding which usually follows. This procedure should be repeated

once or twice weekly till the skin is brought into a favorable condition. It is a harsh method, causing considerable pain and temporary disfigurement, and for these reasons comparatively few patients will submit to it. The effect, however, is often strikingly brilliant.

ALOPECIA (BALDNESS, DEFLUVIUM CAPILLORUM).

The treatment of loss of hair varies somewhat with the cause of the affection. The alopecia or falling of the hair following the various systemic fevers and similar diseases will usually be followed by spontaneous recovery, or recover with applications of mildly stimulating lotions or ointments. The loss or thinning of hair occurring in the secondary stages of syphilis will usually be followed by a re-growth. In all cases of hair loss, however, the hereditary tendency of the family in this particular will exercise great influence upon the prognosis. In those cases in which the alopecia is a part or consequence of a long-continued or neglected seborrhœa, the removal of this latter disease will, as a rule, be followed by a new growth. In some of the cases the subsequent use of stimulating applications may become necessary before the hair shows a disposition to grow again.

There are certain constitutional remedies which have had more or less reputation in the treatment of simple uncomplicated cases. These are arsenic, sulphur, and pilocarpine. These are prescribed in moderate doses, and may be worth a trial in obstinate cases. Other internal treatment is sometimes advised, but only to meet any indications which should exist, such as general debility, anæmia, and the like. The most valuable external applications are sulphur ointment, resorcin lotions and ointment, quinine lotions, lotions containing the tincture of cantharides, and tincture of capsicum. The tar oils are among the most efficacious, but have a limited use owing to their odor. Naphthol, in the proportion of 20–60 grains to the ounce of ointment, is also a valuable stimulating application. The following are the several formulæ usually employed:

℞. Sulphur. præcip., ʒi–ʒij (4.0–8.0);
Acidi salicylici, gr. x (0.65);
Lanolin, ʒij (8.0);
Petrolati, q. s. ad ℥j (30.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Glycerin. ♏x–xx (0.65);
Aquæ, q. s. ad fʒiv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Ol. ricini, ♏x–xx (0.65–1.3);
Alcoholis, q. s. ad f℥iv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Quininæ, gr. xii–xx (0.8–1.3);
Ol. ricini, ♏x–xx (0.65–1.3);
Alcoholis, q. s. ad f℥iv (120.0).—M.

℞. Tinct. cantharidis, f℥i–viij (4.0–30.0);
Tinct. capsici, f℥ss–j (15.0–30.0);
Alcoholis, q. s. ad f℥iv (120.0).—M.

To this last, or to any of the alcoholic lotions, 10 to 25 per cent. of the oil of turpentine may be added. Crude petroleum is a good scalp stimulant, but is somewhat disagreeable to use.

These various applications should be thoroughly made, being well rubbed in. The friction employed is not without value. Indeed, systematic massage is itself of great advantage in the treatment of this condition.

During the period of active treatment shampooing will be more frequently necessary than at other times. The scalp should be shampooed, according to the necessities of the case, every one or two weeks; if the application is carefully made not much soiling takes place and a shampoo every two weeks will usually be found sufficient. For the shampoo, ordinary Castile soap, or one of the tar, sulphur, resorcin or naphthol medicated soaps, or the tincture of sapo viridis, may be used.

ALOPECIA AREATA.

Therapeutists differ somewhat as to the proper method of treatment of this disease, those viewing it as a parasitic disease relying upon external applications, and those looking upon it as a neurosis placing great stress upon the indicated constitutional remedies. These latter writers, however, consider local stimulation of the involved areas also of considerable value. Inasmuch as the stimulants used are almost all active parasiticides, it would seem an advantage to the patient to have the benefit of both external and constitutional treatment.

The systemic remedies upon which stress may be placed are arsenic, strychnine, quinine, iron and the hypophosphites. Other general remedies are, however, to be prescribed if indicated by the patient's

general condition. In short, the general health, especially as regards its nervous tone, should receive careful attention.

The external remedies which are in common use to-day are sulphur ointment, naphthol ointment, 1 or 2 drachms to the ounce, an ointment of oil of cade, 1 or 2 drachms to the ounce, and the oleate of mercury ointment, 5 to 20 per cent. strength. Chrysarobin is especially valuable, and is greatly in favor with those holding the parasitic view of the disease.

Of the liquid applications which are beneficial may be mentioned oil of turpentine, pure or weakened with a plain oil; oil of cade, pure or diluted with alcohol; tincture of cantharides. This last may be prescribed with an equal part of the oil of turpentine and oil of cade. Repeated paintings with tincture of iodine, or repeated blistering are both efficient, at times, in obstinate cases. Painting carefully with pure carbolic acid, not more than four square inches at one time, will act well in some instances; it is repeated, if necessary, once or twice, at the end of which time if a re-growth of hair has not shown itself, it should give place to another plan of treatment. Galvanization and faradization of the affected areas may also be used as adjuvants in rebellious cases.

DARIER'S DISEASE.

Darier's disease, or keratosis follicularis, is a rare affection of the skin characterized by pin-head to pea-sized grayish, dark red or brownish-red hard papules, usually with a central horny sebaceous plug. If the plug is squeezed or pinched out a small pit-like depression is noticed. The lesions arise from the sebaceous or hair-follicles. Usually discrete, although close together, they may here and there aggregrate so closely as to form more or less solid, rough, slightly or moderately scaly, warty patches. The progress of the disease is slow. In some cases papillomatous and more or less pedunculated growths are observed. The palms and soles when affected show more or less thickening, with at times punctate depressions.

It has been both affirmed and denied that the disease is a sporospermosis. An hereditary tendency has been noted in one or two instances.

Treatment has not been successful. Palliation is afforded by the plans of treatment adopted in ichthyosis.

DERMATITIS HERPETIFORMIS.

The promise of a cure of this most obstinate disease cannot be too cautiously expressed. It is always rebellious and often extremely variable even under active treatment. The kidneys should be carefully examined, and in fact the whole patient is to be rigidly investigated. The disorder is, apparently, in many cases due to a chronically depressed nerve vitality. In some cases, especially the grave and pustular and bullous cases, septic conditions may by the responsible factors. On the constitutional management of these cases will depend the prospect of an eventual favorable termination. That the necessary co-operation upon the part of the patient is not always obtainable, or not for a sufficiently long period, will explain at least some of our failures in curing this disease. The diet should be full and nutritious but unstimulating.

The general treatment is based entirely upon indications. Arsenic long continued will in some cases make a favorable impress upon the course of the disease. Quinine in large doses, especially if a malarial poison is suspected, will also act favorably in a few instances. An active purgative two or three times weekly with a saline, concurrently with general tonic treatment, will act surprisingly well at times in mitigating an attack and favorably influencing the course of the disease. Strychnine in large and continued dosage should always be tried. Small doses of nitro-glycerin will occasionally appear to have a favorable action for a time at least. Phosphorus cautiously administered is also another remedy to bear in mind in the treatment of this intractable affection. Among the most valuable tonics may be mentioned cod-liver oil, iron preparations, and hypophosphites. Relief from business or worry of all kinds, and travel may be suggested in proper cases. Sleep-producing drugs, such as sulphonal, trional, phenacetin, the bromides, are necessary in many cases. Opiates are to be avoided, if possible, as the local irritation is often heightened in the after-effect.

Local treatment is always necessary in these cases, owing to the intensity of the subjective sensations of itching and burning. As a rule liquid applications are the most agreeable. The most efficient are those of carbolic acid, of liquor carbonis detergens, boric acid, thymol, thiol, ichthyol, resorcin. Several of these applications are also employed in the treatment of pruritus, to which the reader is referred for formulæ and proportions. Ichthyol, and also thiol, may be used diluted with 10 to 20 parts water. The lotion application may be supplemented with a dusting-powder of talc and zinc oxide, with or without an equal quantity of boric acid.

Mild alkaline baths, 2 or 3 ounces of sodium carbonate or bicar-

bonate to thirty gallons of water; baths of potassium sulphide, 1 to 2 ounces to the bath, prove useful in some cases.

Ointments often become necessary in the vesicular, bullous, and pustular cases. As a rule ointments are not satisfactory in the erythematous varieties. In the moist types Duhring speaks well of a sulphur ointment thoroughly rubbed in with sufficient friction to break down the lesions. It is a strong application and should be used cautiously at first. An ointment of the liquor carbonis detergens, 1 or 2 drachms to the ounce of simple cerate or prepared suet, is another application of value. An ointment of thymol, 5 to 30 grains to the ounce; and one made up with 10 grains of salicylic acid, 2 each of powdered starch and zinc oxide, and 10 grains of camphor, with sufficient petroleum to make an ounce, are both eligible preparations in some instances. The conjoint use, in these latter cases, of one of the above lotions and a supplementary mild ointment, as in the treatment of eczema, is a method which sometimes gives temporary relief to the local distress.

DERMATITIS REPENS.

This is a rare condition, usually having its starting-point at the point of a slight injury, and spreading gradually by a superficial serous or sero-purulent undermining, leaving a red, oozing inflammatory surface resembling eczema rubrum. It is slow in its progress, and is usually seen about the upper extremities. The subjective symptoms are slight. The true nature of the disease is not known, probably being at first neurotic with a subsequent parasitic infection. It is rebellious to treatment. Antiseptic remedies, such as boric acid, permanganate of potassium, resorcin, and the like have proved most effective. Crocker had a good result in one or two cases with the continuous application of lead lactate.

ECZEMA.

There are still conflicting views as to the management of eczema cases. There are those, fortunately a diminishing minority, who look upon eczematous eruptions, as indeed most skin-eruptions, as entirely independent of general or systemic conditions. Such consider the disease a purely local affection, and treat accordingly. That there are cases in which the causative element is seemingly purely local, and

which are responsive to external medication, every one with a large experience must admit. By far, however, the majority of eczema cases, for a successful termination require careful supervision of the patient's general health. Each and every case demands investigation as to the condition of digestion, as to the action of the kidneys, of the liver, and as to the proper functional activity of the other organs. A neurasthenic state is not infrequently a factor of etiological importance. A general debilitated state is also a not infrequent causative element. The condition known as struma is also a predisposing influence in some instances. The gouty and rheumatic diathesis is seemingly responsible for the chronicity of not a few cases. It will be readily seen that the plan of constitutional treatment must be varied according to the suspected or assumed predisposing factor. In all cases indigestible articles of food should be interdicted, and stimulants avoided.

As in the larger proportion of these cases the causes are found to be digestive, remedies such as strychnine, the bitter tonics, salines, and digestives, and the proper regulation of the diet are demanded. Anæmia is to be counteracted with such remedies as full doses of iron, manganese, arsenic, and occasionally minute doses of a mercurial. In anæmic cases, too, plenty of fresh meat should be allowed. Gouty conditions require the cautious use of colchicum, small doses of arsenic and the salicylates, along with the use of an alkaline mineral water taken freely. Rheumatic predisposition requires its special remedies, particularly the salicylates, along with occasional purgation, and plenty of water. Neurasthenia must be combated with the usual treatment and methods. For the strumous diathesis cod-liver oil in moderate dosage is most valuable, and its use in many cases, especially in children, cannot be overestimated.

There remain to be mentioned several remedies which at times seem to exert a specific influence. Arsenic is probably the most important of this group, and yet its failures may be counted by scores and its favorable influence by single cases. It is a disappointing remedy when given for its alleged specific influence. In small doses, however, it may often be given with advantage for its tonic effect. If the remedy has any special value it is in cases of a sluggish scaly and papular type. It should of course be tried cautiously in all cases seemingly suitable for its administration, along with the particular lines of treatment otherwise indicated. Viola tricolor is another remedy which occasionally, especially in the crusted types, exerts a special influence. The infusion or fluid extract is commonly prescribed, and in fairly full doses. The disease is sometimes made temporarily worse; the reaction, however, is favorable. The spirit of turpentine may also be tried, more particularly in extensive and

inflammatory cases. While it is being administered, water should be taken freely so as to inhibit or prevent any irritative influence upon the kidneys. The wine of antimony, in 5-minim doses three times daily, is also a remedy for the actively robust patient with the disease of an acute type. General galvanization and faradization, as well as the use of these currents directly to the diseased surface, have had supporters. Such plans are time-consuming and usually disappointing. Their possible good effects should, however, not be forgotten in the treatment of rebellious cases.

Before taking up the question of local treatment, a few remarks as to the use of water and soap, and to methods of application, particularly of ointments and washes: Water is not to be employed in acute eczema, and in most cases of subacute eczema as infrequently as possible. In fact, with few exceptions water is temporarily damaging in all cases of the disease. A little sweet oil or petrolatum may be used for cleansing purposes when desired. Occasionally, however, it will be necessary to employ soap and water for the sake of cleanliness, and also at times to remove the products of disease and any accumulation of the remedy. The soap, which should be a mild one, should be in scanty quantity, warm to hot water being employed, and then the parts thoroughly rinsed of all the soap, tapped dry with a soft towel or linen, and an ointment application immediately made. In cases in which the products of disease re-accumulate rapidly it may be necessary, for a time, to use soap and water every day or two. In cases of a sluggish type, with either crusting or scaling or simply considerable thickening, soap-and-water washings are sometimes used for therapeutic effect, and to thin down the outer skin so that the remedial application may be brought in more immediate contact with the disease. For this purpose also, as will be subsequently mentioned, sapo viridis is employed in place of a milder soap.

The method of applying ointments to inflamed eczematous surfaces has much to do with securing favorable results. When possible the ointment for the acute and subacute disease should be spread upon patent lint or suitable fabric and applied as a plaster, bandaging on if necessary. It may need to be changed twice daily—always once daily. At the time of changing, the parts should be either washed if deemed advisable or gently wiped with a soft piece of linen and a little sweet oil or petrolatum. In some instances it is best merely to gently wipe the surface with a clean rag and then re-apply the ointment. If plaster-like application is not convenient, the ointment should be applied by gently smearing over the parts a thin film; this should be done two or more times daily. In the subacute and chronic cases, in addition to the above methods of application which may in some instances be considered advisable, the selected ointment is to be

gently but thoroughly rubbed in, in the more sluggish cases using considerable vigor.

Washes or lotions, if free from sediment, may be applied with an atomizer, or a small quantity is poured out and is applied with a soft piece of linen or absorbent cotton. If the wash contain a sediment, the bottle should be well shaken, a small quantity poured into a small saucer as before, and applied in the same manner as just described. Another method of application when a more rapid effect is desired, and when circumstances permit, is to keep soft linen saturated with the prescribed lotion applied constantly, wetting it with fresh lotion from time to time as necessary.

The past ten years or so have seen many new external remedies introduced for which special value has been claimed in the treatment of this disease. Of these a few only have secured a permanent place in the therapeutical management of this disease. The belief in certain quarters in the parasitic origin has had no practical influence upon the external treatment. In fact, almost all the remedies heretofore and now used have possessed parasiticide properties. The principles of local management—mild and soothing protection, moderate stimulation, and active stimulation—of these troublesome cases should always be kept in view, and these principles are the keynotes to the treatment of to-day. For the acute disease, or for the acute type of the chronic disease, mild, soothing, astringent, and antiseptic applications should be employed. For the subacute type, whether the disease is of short or long duration, the same class of remedies will often prove curative; or more frequently it will be found necessary to have recourse to moderately stimulating remedies. For the chronic type—sluggish type—whatever its duration, strong applications will usually be found necessary to bring about a result.

Among the milder remedies in the average case nothing is comparable to a boric acid solution used conjointly with a mild salve, such as the oxide-of-zinc ointment, cold cream, plain petrolatum, or one of these with a small proportion, 10 to 25 per cent., of lanolin. The same holds true of lotio nigra, full strength or diluted with an equal part of lime-water, followed by one of the above salves. A very weak carbolic acid lotion, 1 to 3 grains of carbolic acid to the ounce, may be used in place of either of the above lotions. In the dry forms of the acute types a boric acid or a carbolic acid lotion, with a few minims of glycerin to the ounce, may often be used alone. Resorcin, 1 to 5 grains to the ounce, may be employed for the same purpose; so may also weak lotions of acetanilide. Diluted lead-water is also grateful in some cases. In addition to the several salves already mentioned as useful in the acute or inflammatory type may be mentioned the so-called salicylic acid paste:

℞. Acid salicylici, gr. x (0.65);
Amyli, ʒij (8.0);
Zinci oxidi, ʒij (8.0);
Petrolati, ℥ss (15.0).—M.

℞. Calaminæ, ʒj (4.0);
Ungt. zinci oxidi, ʒvij (28.0).—M.

℞. Liq. plumbi subacetat. dilut., fʒss–j (2.0–4.0);
Ungt. zinci oxidi, ʒiij (12.0);
Lanolin, q. s. ad ℥j (30.0).—M.

℞. Camphoræ, gr. v–x (0.3–0.65);
Acidi carbolici, gr. v–x (0.3–0.65);
Amyli, ʒij (8.0);
Zinci oxidi, ʒij (8.0);
Petrolati, ℥ss (15.0).—M.

℞. Acetanilid., vel aristol, vel bismuthi subgallat., gr. v–xx (0.3–1.3);
Ungt. zinci oxidi,
Ungt. aquæ rosæ, *āā.* ℥ss (15.0).—M.

Lotions which are of special value besides those already mentioned are:

℞. Calaminæ vel zinci oxidi, ʒj (4.0);
Glycerini, ʒss (2.0);
Aquæ, ℥vj (180.0).—M.

℞. Thymolis, gr. vj (0.4):
Sodii borat., gr. ij (0.1);
Acidi borici, ʒiss (6.0);
Liquor. calcis,
Aquæ, *āā.* fʒiij (90.0).—M.

Liquor carbonis detergens, 10 to 60 drops to a small teacupful of water, dilute lead-water, weak solutions of zinc sulphate ($\frac{1}{4}$ to 1 grain to the ounce), and similar mild astringent remedies, are also useful.

Coming into the domain of the treatment of cases of the subacute or mildly inflammatory type, a little more freedom as to the use of stronger applications is permissible. It is, however, a good rule to begin the treatment of all such cases with the mildest kind of remedies, and then gradually increase the strength of applications. The remedies already enumerated are employed also in this type, at first preferably of the strength already indicated, and then if there is no response, or improvement hesitates, increasing the proportion of the active ingredient. This list may, however, be considerably added to.

The various mercurials, in ointment form, more especially calomel, white and red precipitate, oleate of mercury, of from 1 to 5 per cent. strength, are often extremely useful. Resorcin, 5 to 30 grains to the ounce of ointment; alumnol, 20 to 30 grains to the ounce; acetanilide, 10 to 30 grains to the ounce; aristol, about the same proportion; tar ointment 1 part, simple ointment or oxide-of-zinc ointment 7 parts, liquor carbonis detergens, one-half to one drachm to the ounce of ointment, oil of cade in the same proportion, sulphur 3 to 30 grains to the ounce, may be used in this type, occasionally with striking advantage.

Coming to the treatment of the sluggish type of the disease, much stronger preparations may have to be called upon. The strength of those already named may be cautiously increased. In addition to these, however, may be mentioned, an ointment of pyrogallic acid, 5 to 40 grains to the ounce; an ointment of chrysarobin, of the same strength; an ointment of liquor picis alkalinus, ½ to 2 drachms to the ounce; strong salicylic acid ointments, 5 to 15 per cent. strength. Paintings with salicylated collodion, 10 to 40 grains to the ounce, or the painting on of a gelatin film similarly medicated, or the application of the remedy in the form of a rubber or gutta-percha plaster, will be found variously useful. A vigorous shampoo with sapo viridis, followed by a mild or moderately strong ointment application, is also valuable in thickened, sluggish types. In the latter type the salicylic acid rubber or gutta-percha plaster, 5 to 25 per cent. may often be used temporarily. Shampooing with sapo viridis and allowing the lather to remain on a few hours or longer and then following with an ointment may also be tried in the same class of cases. Frequently these stronger applications are to be used to bring the thickened patch into active irritation, the subsequent application being mild to moderately strong; the result of this method is often satisfactory. In the chronic types the tarry applications still occupy a conspicuous place; they should always, however, be used cautiously at first, as certain skins are intolerant.

In the above *résumé* of the methods in ordinary use to-day in the treatment of eczema, nothing has been said as to the treatment of the disease as it occurs on the various regions of the body. This is for two reasons: one being that regional eczema has received extended consideration in the original publication, to which the reader is referred, and the other the fact that the principles of treatment and the remedies employed are the same whatever the part affected. Both circumstances and region affected, it is true, have some influence on the remedies selected, especially as to strength, and on the method or manner of application, but only such changes or modifications as will readily suggest themselves.

ECZEMA SEBORRHOICUM.

Under this head, as remarked in speaking of seborrhœa, there has been a tendency to relegate all cases of this latter disease, also some cases which have heretofore been considered rather anomalous psoriatic cases, and some cases of eczema. The cases from these two latter diseases are those in which there is a decided greasy character to the crusts and scales and a tendency to form segments or ring-like patches. The treatment here considered will refer to all the above cases except those cases of seborrhœa in which the inflammatory signs are, seemingly at least, absent. The most valuable remedies are sulphur, salicylic acid, resorcin, pyrogallic acid, and chrysarobin. The mercurials, especially calomel and the oleate, are also beneficial. Sulphur is employed in ointment in 5 to 25 per cent. strength; salicylic acid, in ointment, 10 to 30 grains to the ounce; resorcin, either in alcoholic or aqueous solution or in ointment, 5 to 30 grains to the ounce, as advised in seborrhœa. Pyrogallic acid is resorted to in the more obstinate cases, using it as an ointment, 5 to 60 grains to the ounce. Chrysarobin is likewise employed in the rebellious cases, about the same strength as the pyrogallic acid. These stronger applications are sometimes advisable in order that a moderate or severe degree of inflammatory reaction may be brought about, the subsequent treatment being of a mild character. This disease is looked upon as parasitic and contagious by the few gentlemen who have written most about the subject. The older dermatologists have, for the most part, failed to be convinced of the contagiousness of the disease, their experience not supporting such a belief.

As to constitutional treatment the strongest advocates of the entity of this disease place essential importance upon external treatment alone. It is advisable, however, to look into the general health of these patients. The effect of local treatment will certainly not be retarded, it will often be materially enhanced, by appropriate systemic medication, more particularly of a tonic nature, with the occasional use of saline laxatives.

EPITHELIOMA.

The milder types of epithelial degeneration only, as a rule, fall to the care of the dermatologist or general practitioner, and the treatment here outlined refers more especially to such cases. The superficial form of the disease (rodent ulcer), which more especially interests us, may exist for years and give rise to no alarm, but there is

always the possibility of its assuming a more malignant phase, and therefore treatment is advisable in all cases. The object of treatment —the destruction or removal of the epitheliomatous or suspected tissue—must not be lost sight of. Whether from incomplete removal or from independent degenerative action, recurrences at the seat of the former lesion are not uncommon. The removal of the diseased tissue may be brought about by the use of such caustics as potassium hydroxide, pyrogallic acid, and the galvano-cautery, and also by means of the curette, and by excision. Various other caustics, as Vienna paste, zinc chloride, arsenical paste, and the like, have also been used from time to time.

The best plan of treatment, if the growth is small and well defined, is excision, bringing the parts together with one or two stitches if necessary, or by adhesive plaster. If the area involved is too great to permit of this method, thorough curetting is advisable; this should be supplemented by momentary cauterization with potassium hydroxide or a strong solution of zinc chloride; if the former is used, its action should, after a minute or two, be neutralized by the application of vinegar or dilute acetic acid. If operative measures are objected to, or if for any reason they cannot be employed, resort must be had to the caustics. For the small superficial and recent lesion, potassium hydroxide may be employed, either in strong solution or as the stick. It should be thoroughly applied for a fraction of a minute or so, the sloughing coat rubbed or picked off as much as possible, and the caustic re-applied; after sufficient action has taken place, vinegar or dilute acetic acid is to be applied as indicated. If the growth is larger, and even in that variety already named, a stiff ointment of pyrogallic acid may be used. A good formula is as follows:

℞. Acidi pyrogallici,	ʒij (8.0);
Emplast. resinæ,	ʒiss (6.0);
Cerat. resinæ,	ʒivss (18.0).—M.

This is to be spread on suitable material and closely applied; it is to be changed twice daily, each time washing the part with warm water, and gently removing as much slough as may have been produced—as much as can be removed by gently rubbing with cotton or a piece of cloth. This treatment is to be continued for from one to three weeks, ten days usually sufficing to produce sufficient destruction. At the end of this time the ointment is reduced to 10 grains of pyrogallic acid to each ounce, and healing is allowed to take place. At times, instead of rubbing off or trying to pick off the slough produced by the caustic ointment, this may be intermitted every few days, and poultices applied for several hours or more till the slough comes

away. In other cases, and in fact in all if the area is not larger than a square inch, the application of an arsenical paste is an admirable method of treatment. The lesion should be freed from any crusting, and then a thick paste made of one part of arsenous acid, two parts of powdered acacia, and sufficient water, thickly applied; over this is placed a piece of patent lint or kid. The paste hardens and makes a firm and adhesive dressing. More or less severe pain is likely to be present in the course of a few hours, or half a day, accompanied with œdema and swelling. The application should be allowed to remain on for from twenty-four to forty-eight hours. If the destructive action has not been sufficient a second application of the same kind should be made; subsequently the part is poulticed till the slough comes away. The after-dressing or treatment of these cases depends somewhat upon the method of removal that has been employed. If this has been effected with the knife or the curette, ordinary antiseptic dressings are to be advised; if with potassic hydrate or pyrogallic acid ointment or the arsenical paste, the same dressing may be employed, or an ointment of pyrogallic acid, from 1 to 2 per cent. strength, or simple resin cerate, with from 5 to 10 grains of carbolic acid to the ounce.

ERYTHRASMA.

This disease presents a symptomatology closely similar to that of tinea versicolor. The disease is, however, usually more or less confined to the folds, as at the axillæ, cruro-genital fold, and cleft of the nates; from these situations it is apt to extend to the immediate surrounding neighborhood. The eruption is not abundant as a rule, consisting of rounded or irregular, well-defined patches slightly purpuraceous, first somewhat pinkish or red, later of a yellowish or brownish tint. It is slow in its progress, lasting for years, and exhibiting no disposition to spontaneous disappearance. Slight itching may occasionally be present. It is due to a vegetable parasite, *microsporon minutissimum*. The therapeutic management is the same as that of tinea versicolor.

ERYTHEMA INDURATUM.

Erythema induratum, the *érythème induré scrofuleux* of Bazin, usually consists of one or several rather deep-seated nodules or circumscribed infiltrations occurring about the lower leg, especially in

the calf region. The disease has also been observed upon the arms. The overlying skin may be entirely normal in appearance or (as it usually becomes) of a livid hue. The process is slow, absorption taking place, or, as generally happens, the indurations gradually break down, resulting in a deep-seated, punched-out ulcer. The condition is not syphilitic, although the ulcers strongly suggest it. It is apparently tuberculous, being seen in strumous subjects, especially girls and young women. The disease is rebellious. The best plan of treatment consists in the applications of mildly stimulating antiseptic ointments and lotions, such as resorcin, boric acid, calomel, oleate of mercury, and aristol. A good method is to thoroughly cleanse out the ulcers with a solution of boric acid and resorcin, and then apply a mild ointment of resorcin, or aristol, or boric acid. In obstinate ulcers curetting may be resorted to. Rest, with the leg in the horizontal position, is more potent than drugs. The constitutional remedies to be prescribed are cod-liver oil and iron, with plenty of nutritious food. Phosphorus has acted well in one case of erythema induratum, but should be given cautiously.

HYDROA ÆSTIVALE (HYDROA VACCINIFORME; HYDROA PUERORUM; RECURRENT SUMMER ERUPTION).

This disease is seen in childhood and early youth, and is recurrent during the same and the following summers. The disposition disappears toward the age of manhood. The manifestation consists of vesicular lesions, somewhat vacciniform in appearance and almost invariably leaving scars. It is seen chiefly on exposed parts. The attacks usually come on after exposure to the sun and wind in the warm season. It first appears as red spots upon which single or several small vesicles develop, sometimes becoming sero-purulent and purulent, drying off gradually and leaving behind a depressed, small-pox-like scar. General symptoms of malaise, anorexia, and rheumatic pains and swellings may usher in the eruption. The attack runs its course, as a rule, in a few weeks. All recorded cases have been males, and young. The nature of the disease is not known.

The treatment consists of the application of the mild antiseptic remedies which are employed in acute and subacute eczema. Exposure to sun and wind and even to great artificial heat should be avoided. Internally, arsenic and quinine have received the most favor.

HYPERIDROSIS.

The treatment of general hyperidrosis consists in removing or remedying the associated or underlying disease. Existing independently, the management is the same as that for the local forms. Of these latter—hyperidrosis of the hands, especially the palms, hyperidrosis of the feet, especially the soles, and hyperidrosis of the axillæ—that of the feet and soles comes most frequently for medical relief. In some of the cases, probably from a development of the *bacterium fœtidum*, the sweat becomes of an extremely fœtid odor (bromidrosis, osmidrosis).

Chief reliance is to be placed upon external applications, although any existing faulty condition in the general health is to be corrected. There are several systemic remedies, however, which are thought at times to have a specific influence, and which should, therefore, be prescribed in urgent or obstinate cases. These are ergot in full doses, strychnine, belladonna or its alkaloid atropine, aromatic sulphuric acid, agaric, pilocarpine, and sulphur. This last is given in teaspoonful dose morning and evening, and its laxative action limited, if necessary, by some mild astringent.

As to local treatment, dusting powders are of value, the most efficacious being—

℞. Acidi borici, ʒj (30.0).

℞. Acidi salicylici, gr. x–xxx (0.65–2.0);
Acidi borici, ʒj (30.0).—M.

℞. Bismuthi subnit., vel tannin, ʒj (4.0);
Acidi borici, vel talci Veneti, ʒj (30.0).—M.

℞. Acetanilid., gr. xx–lx (1.2–4.0);
Acidi borici, ʒj (30.0).—M.

The selected powder should, after a soap-and-water washing, be freely dusted over the parts and also into the socks or stockings. Cork inside soles should be worn, and should be washed daily in boric acid solution. Lotions of alum, zinc sulphate, tannin, 1 to 5 per cent. strength; a 1 to 2 per cent. alcoholic solution of quinine or acetanilide, tried alone or conjointly with one of the above dusting-powders, are also beneficial. In more obstinate cases, strapping with soap-plaster will be found useful. Salicylated mutton suet, 2 per cent. strength, applied daily, is also valuable. In extreme cases of hyperidrosis or bromidrosis of the feet the continuous application of diachylon ointment or a 10 to 20 per cent. tannin ointment, changing twice daily

for a period of two or three weeks, will frequently relieve and cure. In this latter method soap-washing should be for the time, except as a preliminary measure, avoided, the parts being wiped clean at each change of the ointment, with a soft towel and dusting powder. Finally, a trial may be made of faradization and galvanization of the affected parts.

LEPRA (LEPROSY; ELEPHANTIASIS GRÆCORUM; LEONTIASIS).

In the general mind leprosy has always been considered incurable, but there are recorded cases in which the disease was halted in its progress and also permanently relieved. This possibility should be recognized in every case, and proper and energetic measures persistently advised and carried out.

In the constitutional treatment, irrespective of remedies that may from time to time be indicated by accidental conditions, three drugs have gained considerable reputation as having special influence—strychnine, gurjun-oil, and chaulmoogra-oil. These should be tried in increasing doses. In addition to medication, hygienic measures are of great importance. The removal of the patient to a climate or country where the disease is not endemic or does not exist is a measure of great value. Ichthyol and other drugs have been variously advised, but the three named are those from which the most satisfactory results have been derived.

Externally, the oils mentioned, as well as ichthyol, pyrogallic acid, resorcin, and chrysarobin, have been extolled, applied usually in the form of an ointment in about the same strength as employed in psoriasis. It is generally recognized, however, that the external treatment is rarely more than palliative, and that it is to be employed or not according to the indications.

LICHEN PLANUS.

This disease is seen most frequently in those of nervous temperament and in the neurasthenic class. The constitutional remedies must be directed toward improving the general nutrition and an invigoration of the nervous energy. For this purpose the ordinary tonics, iron, quinine, strychnine, cod-liver oil, and arsenic, are the available remedies. Arsenic and iron are the most important, the former especially often exerting a positive curative influence. It

should not, however, be administered in too large doses; it rarely benefits if no impression is made with 5-minim doses thrice daily. It may be given with advantage, especially if an excitable state of the nervous system exists, with the fluid extract of lupulin. A liberal diet should be permitted, and a little Burgundy at dinner allowed. Or, in place of this last, a tablespoonful of the wine of beef and iron may be administered after each meal.

Local treatment is of great importance. The most valuable remedy in my experience is liquor carbonis detergens—a solution of coal-tar in the tincture of soap-bark. It may be prescribed in ointment, 1 or 2 drachms to the ounce of simple cerate or prepared suet; or it may be used as a wash, with several or more parts of water, increasing the strength, even up to the pure solution if irritation is not produced. Tar in other forms is also beneficial, but the coal-tar solution has not the same disadvantages for private practice that the other tarry preparations possess. An ointment of carbolic acid and thymol, of each 5 to 30 grains to the ounce, may also be employed with advantage. An ointment of carbolic acid 20 grains, corrosive sublimate $\frac{1}{2}$ to 1 grain, and oxide-of-zinc ointment 1 ounce, is largely used, although it has not been particularly serviceable in my hands. The carbolic acid washes and the zinc and calamine lotions mentioned in eczema are also of value.

In obstinate cases strong stimulating applications are necessary; for this purpose a mixture of equal parts of liquor carbonis detergens, tincture of green soap, and liquor calcis sulphuratæ, may be tried, rubbing it in twice daily, and following with mild applications should active irritation result. In extreme cases bran and alkaline baths are serviceable and give relief to the burning and itching.

LICHEN SCROFULOSUS.

This is a rare affection of the skin seen in scrofulous subjects, and consists of small, mildly inflammatory papules tending to form irregular and crescentic groups. The papules vary in size from a pin-point to a pin-head, and are, when fully developed, of a yellowish red or fawn color. The older papules are usually capped with a minute scale. The lesions are slow in development and may remain for months; new lesions arise, and the disease is thus kept up almost indefinitely. After the typical eruption disappears, slightly yellowish spots remain. The trunk is the usual site for the disease. A few acne-like papules or pustules may be present. The pathological condition consists of cell-infiltration of the papillæ immediately surrounding the follicle. Treatment is always followed with favorable result.

This consists of the administration of cod-liver oil and the application, by gently rubbing in, of a mildly or moderately stimulating application, such as a mild resorcin, tar, or sulphur ointment.

LUPUS ERYTHEMATOSUS.

Lupus erythematosus is not only a stubborn and chronic disease, but it is often strikingly capricious. A patch may after weeks or months spontaneously disappear, new patches arising from time to time. The disease usually leaves behind a thinned or atrophic condition of the skin, but it is to be borne in mind that its disappearance may take place without a trace. This fact is not to be lost sight of in the medicinal management of the disease. In short, destructive or operative methods or any method which will leave scarring as a result should not be employed except in the persistent and rebellious disease, especially in those cases which show no tendency to spontaneous involution. There are two visible factors in a case of lupus erythematosus: one is the inflammatory or hyperæmic element, and the other is the cell-growth or infiltration. In the cases of the former class the mildest kind of application should at first be employed, gradually having recourse, should these fail, which they often do, to stronger remedies. In the conspicuous cell-growth or infiltration varieties or types a more stimulating plan of treatment may usually be prescribed from the start.

A few words first as to constitutional treatment: The true etiology of the disease is not known. It has been alleged that it is allied to lupus vulgaris in having the tubercle bacillus as the cause, but the overwhelming consensus of opinion is against such a view. The patient's general health should be investigated, and any needed remedies prescribed according to indications. There are several drugs which have, in some instances, seemed to exert some influence. These are cod-liver oil, the iodides (especially the iodide of starch), phosphorus, and arsenic. In some cases there seems to be some digestive or assimilative irregularity; in such, saline laxatives, along with stomachics and digestives with strychnine, at times make a favorable impression upon the activity of the disease.

Recurring to local treatment, among the most valuable mild applications may be mentioned—

℞. Zinci oxidi,
Calaminæ, āā. ʒj (4.0);
Zinci sulphat., gr. xx–xl (1.3–2.6);
Glycerini, ♏xx (1.3);
Aquæ, fʒiv (120.0).—M.

℞. Acidi borici, ʒj (4.0);
Resorcin, ʒss–ʒij (2.0–8.0);
Zinci sulphat., gr. xx–xl (1.3–2.6);
Aquæ, fʒiv (120.0).—M.

℞. Zinci sulphat.,
Potassii sulphuret, āā. ʒss–ij (2.0–8.0);
Aquæ, ℥iv (120.0).—M.

℞. Sulphur præcip., ʒij (8.0);
Zinci sulphat., gr. xx (1.3);
Tragacanthæ, gr. xxx (2.0);
Aquæ, ℥iv (120.0).—M.

A method of treatment which is not without value in some cases is that which consist in nightly shampooing the affected parts with the tincture of green soap, rinsing, and following with one of the several lotions already named; or, if there is a good deal of irritation, following with some mild salve, such as cold cream or oxide-of-zinc ointment. If after a time the soap-washings are not followed by any cutaneous irritation, or should that be the case from the first, it may be followed with a stronger ointment application such as—

℞. Ungt. sulphur præcip., ʒj–ij (4.0–8.0);
Aquæ rosæ, ʒvj (24.0).—M.

℞. Hydrarg. oleat. (20 per ct.) ʒij–iv (8.0–16.0);
Cerat. simplicis, ʒij (8.0);
Petrolati, q. s. ad ℥j (30.0).—M.

℞. Ol. cadini, ʒj (4.0);
Cerat. simplicis, ʒvj (180.0).—M.

℞. Aristol, gr. xx–lx (1.3–2.0);
Petrolati, ℥j (30.0).—M.

Painting the parts with a medicated collodion:

℞. Acid. salicylici, gr. xx–xxx (1.3–2.0);
Zinci oxidi, ʒss (2.0);
Calaminæ, gr. x (0.65);
Collodii, ℥j (30.0).—M.

is sometimes of material advantage.

Among the stronger applications which may be used alone or in conjunction with ordinary toilet washing, or following the washing with the tincture of green soap, may be mentioned the oil of cade

(pure), strong tar or sulphur ointment, an ointment of pyrogallic acid, 10 to 40 grains to the ounce, a strong calomel or white precipitate ointment, 40 to 80 grains to the ounce.

The stronger applications which may be required are a salicylated collodion, 20 to 60 grains to the ounce, collodion medicated with resorcin, 2 to 10 per cent. strength, beginning with the weaker. Pyrogallic acid may also be used cautiously in the same manner, 10 to 40 grains to the ounce. Painting the parts over with pure liquid carbolic acid, and repainting again a day after the crust thus formed has fallen off is valuable in some cases, although somewhat painful. The cautious application of arsenical paste or ointment, or the caustic pyrogallic acid ointment, referred to in the treatment of lupus vulgaris, may be used. Such strong applications should only be employed in obstinate and unyielding patches, as a variable amount of destructive action follows their use. Salicylic-acid-creasote gutta-percha plaster is of advantage in such cases, the destructive action being usually slight.

The operative plans may also be resorted to in this latter class of cases. Repeated linear scarification, as in lupus vulgaris, is much more applicable in this disease. If the patch is small, curetting, with subsequent slight cauterization, as in lupus vulgaris, is also a valuable method. The actual cautery, Paquelin cautery, or, best of all, the galvano-cautery, may be employed when destructive methods are deemed advisable. It has seemed to me, however, that these cautery methods are more apt to be followed by keloidal tendency.

LUPUS VULGARIS.

That lupus is due to the invasion of the cutaneous tissue by the tubercle bacillus is now pretty generally admitted. Constitutional treatment is, therefore, relatively of little importance compared to local treatment. In some cases, however, certain constitutional remedies appear to have a favorable influence upon the progress of the disease, and to aid materially in maintaining the effect produced by local measures. Cod-liver oil in continued and moderate dosage is the most valuable of this class. The iodine and iron preparations are also of value in some instances. The treatment by hypodermic injections of tuberculin, 1 to 2 milligrammes at each injection, repeated at intervals of several days to a week, is a method that may be employed as a *dernier ressort* in severe and obstinate cases, either alone or (preferably) conjointly with a thorough curetting or cauterization. It should not be used if there is a suspected dormant tuber-

culous deposit in the lungs or any other organ, and the proper antiseptic precautions are to be scrupulously observed.

Owing to the observation, now several times made, that an accidental erysipelas sometimes cures an existing lupus, the artificial production of this disease by inoculations of the products of benign erysipelas has been advised. The resort to such treatment would not be without positive danger, and would not be justifiable except in rare instances. It is of course understood that whatever plan of treatment is pursued, the patient is to be placed in the best condition of health possible, with plenty of fresh air, exercise, and nutritive food.

The plans of treatment of lupus most practised to-day are those in which operative measures figure largely. Before referring to the several operative methods in vogue, reference to the milder or non-operative plans occasionally adopted may be briefly mentioned. There are two elements to be considered in an average case of moderately advanced lupus: one is the inflammatory element, and the other the new cell-growth. The various soothing applications described in the treatment of acute and subacute eczema will in some instances have a material influence on the former and in this manner lessen the conspicuousness of the lesions. Actual improvement in the disease itself is exceptionally noticed even in this method of treatment; permanent improvement with such applications is, however, hardly to be anticipated. Stimulants, which for the most part are parasiticides, will in a few instances exert a favorable influence upon the course of the disease. Of the last class of remedies the mercurials are the most valuable. An ointment of the oleate of mercury, 5 to 25 per cent. strength, or one of corrosive sublimate, $\frac{1}{2}$ to 2 or more grains to the ounce, mercurial plaster, and corrosive sublimate lotions, $\frac{1}{2}$ to 2 grains to the ounce, have all been of proved value in some cases.

As to the destructive methods of treatment one of two plans may be adopted, or they may be employed conjointly. The several caustic methods advised by different dermatologists to-day are: A guttapercha plaster containing 10 to 25 per cent. salicylic acid and the same, or a greater quantity percentage, of creasote; an ointment of pyrogallic acid, 25 per cent. strength; arsenous acid, 10 grains, cinnabar, 20 grains, and simple ointment, half an ounce. These several caustic applications are kept constantly applied, a fresh application being made at least once daily. After a certain number of days, about ten days to three weeks, with pyrogallic acid ointment, about the same time with the salicylic acid combination, and after three or four days with the arsenical ointment, the treated parts are poulticed for twelve to twenty-four hours to remove the slough, and a mercurial ointment or plaster applied. Several repetitions of these caustic

methods must often be made before complete recovery takes place; and in some cases the result is not very satisfactory. Other methods of cauterization are: with the actual cautery, the galvano-cautery, and the Paquelin cautery.

Of the operative methods the one most generally employed is that which consists of thoroughly curetting the diseased tissue. After this a mercurial plaster is applied, or what is certainly of greater value, pyrogallic acid ointment for several days, and subsequently the mercurial plaster. Linear scarification is another favored method —rather tedious, but with good cosmetic results. The part is thoroughly cross-hatched with a sharp bistoury, single or multiple, the incisions being close together; this is followed by mercurial plaster. At the end of one or two weeks the same procedure is again practised, and so on till the result justifies its discontinuance. Recurring isolated tubercles in the scar or at the edges of the original area may be treated by boring into them with a pointed stick of silver nitrate, or by boring into them with a dental burr; or the curette may be used for their removal.

MYCOSIS FUNGOIDES.

This disease has been described under various names, such as "granuloma fungoides," "inflammatory fungoid neoplasm," "*lymphadénie cutanée*," "sarcomatosis generalis." The disease is insidious and chronic, being slowly progressive, and with two exceptions ending, after a variable number of years, fatally. It begins with symptoms of an eczematous, urticarial, and erysipelatous nature, which may be somewhat capricious and irregular and last for some weeks or years. Itching is apt to be a troublesome symptom. Later other symptoms are added; papular and tubercular and tumor-like elevations present themselves, of a pinkish or red color, some becoming ulcerative and fungoidal. These growths, which may be quite imposing in character and size, occasionally undergo resolution and disappear. New growths, however, make their appearance from time to time and may exist in profusion. Exceptionally the disease begins with the appearance of new growths. Finally, from gradual exhaustion and the supervention of septicæmic symptoms, the patient succumbs. The true nature of the disease is not known. The only recoveries have resulted from the administration of arsenic, preferably by the hypodermic method. Otherwise treatment, both local and constitutional, is based upon general principles.

PITYRIASIS RUBRA PILARIS (*Devergie*).

This is a rare disease, characterized by a dry scaly follicular eruption, which may be somewhat limited or may become more or less general. In cases of the limited disease the most striking features are the follicular papules and moderate scaliness, variable infiltration or thickening, with a harshness and accentuation of the lines of the skin. In the extensive cases these same features obtain, usually in a more pronounced manner, and in some places the scaliness is so marked that the follicular character of the disease is not readily recognizable. In other parts of the body, especially about the back of the neck and in the flexures, the follicular and papular characters are so pronounced that such areas roughly resemble mild ichthyosis hystrix. Taken as a whole, the disease roughly presents features of psoriasis, keratosis pilaris, and ichthyosis. Inflammatory signs are practically absent or mild in character. The nature of the disease is not understood.

The treatment is essentially that of psoriasis, although arsenic, if used, is to be prescribed with caution, as it may make matters worse. Exciting the sweat-secretion with pilocarpine and warm baths should be a part of the treatment.

POMPHOLYX (CHEIRO-POMPHOLYX).

This disease is rather uncommon. It is characterized by a vesicular or bullous inflammation limited to the hands and feet, and may be sudden or gradual in development. A good deal of œdema and swelling, with pain, burning, and sometimes itching, are also observed. The lesions are, at first at least, somewhat deep-seated. A condition of hyperidrosis of the parts is sometimes seen as preceding and accompanying the disease. The hyperæmic element is usually slight, the affected parts often having a sodden appearance. The disease is observed in those of a nervous temperament who are depressed in health. It tends to recur at irregular intervals. The immediate attack usually subsides after a few weeks. Treatment is essentially that of acute eczema. The constitutional treatment is with active tonics, such as arsenic, iron, and strychnine.

PRURITUS.

Pruritus is sometimes met with in the course of certain organic and systemic diseases, sometimes as a symptom of a functional disorder, and sometimes apparently independently of any constitutional

factor. In all cases a careful investigation must be made into all the possible etiological factors, the kidneys, liver, and digestive tract especially receiving attention. The constitutional treatment will therefore be directed toward removing any condition which may seem to have a predisposing influence. In many of the cases the digestive tract will be found at fault. Salines and antacids, especially the sodium salicylate, have an important place in the treatment. In the apparently causeless cases constitutional treatment is entirely empirical. Atropine, potassium bromide, sulphonal, antipyrin, lithia salts, cannabis indica, gelsemium, pilocarpine, lupulin, ammonium valerianate, and similar drugs are variously prescribed, and often with relief.

External treatment is always necessary for immediate effect. The most valuable applications are: a lotion of carbolic acid, 1 to 3 drachms, alcohol 1 ounce, and water to make a pint; a lotion of liquor carbonis detergens, 1 to 4 teaspoonfuls to the teacupful of water up to the pure solution; liquor picis alkalinus, 1 to 4 drachms to the pint of water, used cautiously; one of benzoic acid, 2 to 4 drachms, the same quantity of glycerin, and a pint of water.

In some instances, especially in some cases of senile pruritus when the skin is harsh and dry, oily or ointment applications are more beneficial. Benzoic acid, 10 to 30 grains to the ounce of petrolatum and lanolin; menthol, 5 to 20 grains to the same ointment base, or in liquid petrolatum; an ointment of the same base with 10 to 30 grains each of camphor and chloral to the ounce; one of carbolic acid, 5 to 20 grains to the ounce, and similar remedies incorporated in salve form, will be found among the most satisfactory.

In the local forms of pruritus—pruritus scroti, pruritus ani, and pruritus vulvæ—the same applications will also be found useful. In addition to the above may be mentioned a solution of silver nitrate in spirits of nitrous ether, 5 to 10 grains to the ounce, painted carefully over the parts in pruritus scroti; the tincture of benzoin painted carefully over the parts in obstinate pruritus vulvæ; and cocaine and menthol lotions or ointments, 1 to 5 per cent. strength, in pruritus ani. In these local varieties sponging with hot water, as hot as can be borne, will often give temporary relief.

In pruritus hiemalis, that form of the disease which in some individuals makes its appearance as soon as cold, dry, and windy weather sets in, the above applications may be tried one after the other till relief is afforded; ointment applications are the more generally useful in this variety. In the pruritus immediately following a bath, which not a few persons suffer from, glycerin lotions, 1 or 2 teaspoonfuls to two tablespoonfuls of water, a mild ointment application such as petrolatum or cold cream, or a lotion of carbolic acid, will afford some relief.

PSORIASIS.

It can scarcely be said that any great progress has been made in the treatment of psoriasis in the past ten years. The various remedies, both external and internal, which have been employed have, it is true, been weighed in the school of experience, and the result is the status of to-day. The medical treatment should have the full co-operation of the patient as to proper regulation of the diet, outdoor exercise, and the avoidance of stimulants.

As to diet it is difficult to state positively how much influence it has for good or bad, but it is known that foods which will lead to any disturbance of digestion or those which are of difficult digestion will have a varying unfavorable influence and tend to retard recovery. Over-eating and lack of compensating exercise will also influence the disease unfavorably. Occasionally patients are met with who will respond more rapidly to treatment when they have the aid of a largely vegetable diet; and on the contrary some cases will do well on just the opposite, almost a purely meat diet. Each case must be studied individually.

As to the constitutional medicinal treatment, that plan will be most frequently successful that takes a comprehensive view of both the patient himself and his skin-disease. Any existing irregularity in the general health must be looked after. The bowels are to be kept sufficiently free. In those cases in which debility is the predisposing factor—for instance, psoriasis occurring in women during the nursing period—suitable tonics are to be administered, especially the hypophosphites, cod-liver oil, and iron preparations. In those patients in whom there is a distinct gouty or rheumatic underlying cause, the alkalies, salicylates, salicin, colchicum, and other remedies of this class come into play. In short, not a few patients with a psoriatic tendency will remain practically, or in great measure, free from cutaneous eruption so long as a proper tone of the general health is maintained.

Irrespective of any recognized constitutional predisposing factors, certain remedies may be tried when a line of treatment based upon the above suggestions fails. The remedies of this class which have more or less of a recognized use to-day are arsenic, the alkalies, potassium iodide, tar, spirits of turpentine, wine of antimony, oil of copaiba, and thyroid gland. Of these arsenic stands first in value. It may, in fact, be said to exhibit a specific control of the disease in at least a fairly large proportion of the cases. Its value is shown most in the beginning attacks or in those cases, even if of long duration, in which the remedy has as yet not been systematically employed. In subsequent attacks its usefulness is not so well marked, and it frequently fails

absolutely. Its action is usually unfavorable in the markedly acute spreading disease. In other cases it may be given along with other lines of treatment. The dose should rarely exceed ten drops of Fowler's solution three times daily or the equivalent of arsenous acid or the solution of sodium arsenate. The beginning dose should be small, about 3 minims of Fowler's solution, and, if there is no improvement and no unfavorable symptoms from the arsenic itself, the dose may be gradually increased. The average dose is about 4 or 5 minims. The alkalies are, as already referred to, useful in the rheumatic and gouty cases, but independent of any such recognized factor or complication, they seem to be extremely useful in the actively inflammatory disease occurring in robust and plethoric individuals. It is also especially in this last class of cases that wine of antimony may be tried, giving 5 to 8 drops three times daily. Spirit of turpentine is given in 10- to 30-drop doses three times daily, in capsule or emulsion, preferably the latter. During its administration, and also with the administration of the oil of copaiba, large doses of water should be taken throughout the day, or some demulcent drink such as barley-water. Its action upon the kidneys and bladder must be carefully watched, especially if the largest doses are given. Tar may be administered in capsule or emulsion, the dose being 10 to 30 minims. Potassium iodide, if given in large doses, 20 to 60 or more grains thrice daily, will have a favorable influence in some cases, but its effects, especially in the largest doses, should be supervised. Thyroid extract, in 1- to 5- or even 10-grain doses may be tried in persistent obstinate cases, the remedy being discontinued or the dose diminished should any untoward symptom arise.

The external treatment is all-important in most cases. In individuals in whom the disease is sparse, or but slightly inflammatory, a daily warm bath of five to twenty minutes' duration, or a weak alkaline bath, will, along with suitable systemic treatment, often bring about a favorable result. Even in more extensive cases, more especially where the spots or patches are small, this same plan of external treatment, especially with the alkaline baths, will prove curative. If the skin should, as a result of the use of the alkaline baths, become somewhat harsh and dry, some simple ointment may be rubbed in after each bath. Equal parts of petrolatum, cold cream, and lanolin, with 10 grains of salicylic acid to the ounce, is a good formula. The bath is, of course, to be employed in all cases of the disease not only for the slight or great influence in itself which may be exerted, but also for the reason that it is essential in keeping the patches free from scales; this latter condition is necessary for the proper and efficacious application of the active remedies to be referred to. In markedly acute cases or in cases of a markedly inflammatory type, bran or

starch baths may be demanded at first till the acuteness of the symptoms has subsided. Cases are unusual, however, in which mild alkaline baths cannot be employed from the first. In some cases the sulphur bath, made with potassium sulphuret, 2 to 6 ounces to the bath (about thirty gallons) is beneficial, followed by a mild or strong salve according to circumstances.

When the disease exists in large patches or diffused areas, the more active or special external remedies are to be used. The most generally employed at present are tar, chrysarobin, pyrogallic acid, naphthol, white precipitate, aristol, resorcin, gallacetophenone. Tar is one of the oldest applications employed in this disease, and therapeutically speaking it is for the general run of cases the most satisfactory and effective. Its odor bars it out, however, from the general use it otherwise deserves. The pure tar ointment, at first weakened with lard or petrolatum, the oil of cade, and the oil of birch, 1 to 3 drachms to the ounce of simple cerate or prepared suet, or with olive oil or alcohol, or pure, are the preparations most in use. The ordinary tar ointment is the most objectionable. Another preparation of tar is that known as liquor carbonis detergens. This last is a solution of coal-tar in the tincture of soap-bark. It is not so efficient as common tar, but it is much more elegant and its odor is less persistent. It may be used pure or weakened with water, and rubbed into the patches, or it may be incorporated with simple cerate or suet, 2 or 3 drachms to the ounce; or it may be prescribed with an equal part of liquor calcis sulphuratæ and used as such in full strength or weakened with water. Chrysarobin may be applied as an ointment, 30 to 60 grains to the ounce, or as a paint with collodion or gutta-percha solution. In these latter it is common to add 10 to 30 grains of salicylic acid to the ounce. If the collodion is used as the vehicle, 5 minims of castor oil may also be added to the ounce to make the film somewhat more flexible. Pyrogallic acid may be used similarly to chrysarobin and in the same strength; it should not, however, be applied too extensively at one time, for fear of absorption and toxic action. Both of these drugs are active but have some disadvantages. Both stain, chrysarobin very positively, pyrogallic acid slightly; and both, if used carelessly, may provoke a mild or severe dermatitis of the surrounding skin, more especially the chrysarobin. If carefully used, however, this latter disadvantage may be guarded against, and if signs of cutaneous irritation show themselves may be temporarily suspended. The salve is the most energetic, but thus used the disadvantages mentioned are more apt to present themselves. If the paint is employed, an application is made about every three or four days. At the end of this time the film has either fallen off in part or in entirety, or may be readily washed or picked off, and a new

application may be made. Gallacetophenone, aristol, and resorcin are used in the form of ointments, about 40 to 60 grains to the ounce. White precipitate is also employed in the same strength, and as it is a white preparation it is more particularly employed for the disease upon the scalp. Naphthol, about 1 drachm to the ounce, is a reserve remedy of about the same efficacy as the remedies last mentioned, and is employed as an ointment, 30 to 60 grains to the ounce. An ointment, if employed should be energetically rubbed into the patches, and the excess wiped off and the parts sprinkled with a dusting-powder. If a liquid application is made, such as the liquor carbonis detergens or its admixture with liquor calcis sulphuratæ, it should be rubbed in well; if after a few days the skin should seem harsh, a mild salve is to be used in conjunction with it.

PURPURA.

An opinion as to the outcome or even duration of an attack of purpura cannot be stated with certainty. The milder types (purpura simplex) give rise to no discomfort as a rule, and sooner or later pass away with or without treatment. Occasionally this form persists more or less continuously for months or for several years. Exceptionally it may pass into the hæmorrhagic type, and may then be of possible serious import. In the more severe types (purpura rheumatica, peliosis rheumatica) the symptoms are somewhat more urgent, often including rheumatic pain and swelling of the joints, together with mild or severe febrile disturbance. These cases, also, usually get entirely well in the course of a few weeks or months, but as in the mildest examples of the disease this type may also exceptionally pass into the more grave hæmorrhagic form (purpura hæmorrhagica, "land-scurvy," morbus maculosus Werlhoffii). This grave type is not very common, and the cutaneous hæmorrhages partake more of the nature of ecchymoses and extravasations. There may occur also bleeding from one or several of the mucous surfaces, so that the patient's condition soon develops into one of profound anæmia. In rare instances the hæmorrhages from the mucous surfaces, the mouth, nose, bowels, or lungs, may be so profuse as to lead to rapid collapse and even death.

The treatment of the various forms of purpura vary somewhat according to the type. The remedies usually prescribed are oil of turpentine, oil of erigeron canadensis, ergot, dilute sulphuric acid, tincture of ferric chloride, strychnine, silver nitrate, and gallic acid. If, as in most of the mild examples of the disease, there is no appar-

ent etiologic factor, the remedies to prescribe are ergot, gallic acid, and turpenture. If the disease seems dependent upon, or is associated with, an anæmic or chlorotic condition, then iron, quinine, and strychnine are usually given, commonly in conjunction with one of the purely astringent remedies first named. In the grave cases ergotin, gallic acid, and turpentine are depended upon for controlling the hæmorrhage; other treatment indicated by the general condition of the patient is likewise instituted. In purpura rheumatica and purpura hæmorrhagica perfect rest in the recumbent position should be enjoined as long as the symptoms are urgent. For some time after the disease disappears the state of the patient's health should be looked after, and all possible measures taken to place him in as good general condition as possible; by so doing the possibility of relapses, which are not at all uncommon, may be prevented.

As a rule external applications are not called for in purpura; astringent applications to bleeding mucous surfaces will aid in checking hæmorrhage from these parts.

SCORBUTUS (SCURVY; SEA-SCURVY; PURPURA SCORBUTICA).

This disease often comes under the care of the dermatologist owing to the cutaneous symptoms. The prognosis is favorable, the disease being remediable and usually rapidly so. This is true in cases in which the predisposing causes are no longer acting. When, however, the same bad hygienic conditions, unfavorable circumstances, and ingestion of scanty and unsuitable food are continued, the patient's health becomes gradually worse and worse, and death finally ensues. Successful results, therefore, usually require, first of all, proper hygiene in the wide sense of that term, and proper food, with an abundance of fruit and vegetables. Lemon-juice and lime-juice, for both curative and preventive purposes, have always proved of great value; they should be taken freely. The general condition of the patient must be cared for, and tonics and stimulants prescribed when deemed necessary. The essential treatment, however, lies in the proper food-supply. Unless ulceration is present the cutaneous manifestations, as a rule, require no special attention. If there is ulceration, the ordinary mild and antiseptic astringent ointments and lotions used in eczema may be employed. For the tumid and spongy gums, astringent mouth-washes of myrrh and potassium chlorate may be used.

SEBORRHŒA.

THERE is a strong tendency to crowd seborrhœa out of the dermatological list, and place the cases heretofore belonging under that head in the domain of Unna's "eczema seborrhoicum." Inasmuch as this writer holds that the oil is excreted by the sweat-glands, the heretofore so-called "seborrhœa oleosa" he would term "hyperidrosis oleosa." For our present purpose it is just as well to consider under the present heading all those cases of scaly and slightly crusted condition found upon the scalp and about the region of the nose, unaccompanied with any visible signs of inflammation.

Successful treatment requires a careful supervision of the patient's general health, and the importance of this part of the management is not lessened by the fact that present opinion seems to be inclining toward considering the disease as possibly parasitic and contagious. The disease is seen most frequently in those of sedentary habits, in the anæmic and debilitated, and in those of weak digestion. It is true that in a not inconsiderable number of the cases there seems to be nothing at fault with the general health. In such cases constitutional medication is not called for. The line of systemic treatment depends upon a study of each case. Laxative, digestives, iron and arsenic preparations, and cod-liver oil, are therefore prescribed most frequently. There are no specifics.

As to external treatment it is essential that the scalp or part affected be kept free from scaliness or crusts. This is done by an occasional shampoo in mild cases and a daily washing in the markedly crusted or scaly cases. After the case is under way, the frequency of the shampoo will depend upon the rapidity of the re-accumulation of scales or crusts, and also the amount of soiling brought about with the remedies employed. For average cases the shampoo may be made with the ordinary toilet soap or a boric acid soap; in cases in which the crusting is marked and adherent, the tincture of sapo viridis may be used. In a few of these severe cases one or two preliminary soakings in carbolized oil may be necessary before the crusts yield to the shampoo.

The important remedies for external application are sulphur, resorcin, salicylic acid, salol, aristol, and white precipitate or calomel. Sulphur is employed as an ointment, 30 to 60 grains to the ounce of petrolatum or lanolin and petrolatum; salicylic acid is frequently added to this ointment, or may be prescribed alone, 10 to 20 grains to the ounce; salol, in ointment, 20 to 40 grains to the ounce; white precipitate and calomel, in the same manner and in the strength of 20 to 60 grains to the ounce. Resorcin, next to sulphur and the mercurials in value, may be prescribed in aqueous or alcoholic solu-

tion, and is extremely useful, especially in the milder cases, and in the severe cases in the later stages of the treatment. The following formulæ are usually prescribed:

℞. Resorcin, gr. xl–lxxx (2.6–5.3);
Glycerin, ♏x–xx (0.65–1.2);
Alcoholis, ʒss (15.0);
Aquæ dest., q. s. ad fʒiv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.6–5.3);
Ol. ricini, ♏x–xx (0.65–1.2);
Alcoholis, fʒiv (120.0).—M.

A valuable addition to the alcoholic lotion, especially when there is a disposition to alopecia, is the alkaloid quinine, 3 to 5 grains to the ounce. Resorcin is also used in ointment form, 10 to 40 grains to the ounce. The applications are to be made, as a rule, once daily; later at less frequent intervals, every two days, and gradually lessening the frequency to once or twice weekly. In those especially predisposed to the disease and in whom recurrences are common it is advisable to continue the remedial applications once or twice weekly, and to shampoo the head once every ten days or so with a medicated soap of sulphur-naphthol or resorcin. For the oily form of the disease upon the scalp, the alcoholic lotion of resorcin or of resorcin and quinine is especially valuable.

For seborrhœa of the nose and its immediate neighborhood, of the slightly scaly or crusted type, the same plan of treatment as employed for the disease upon the scalp is to be commended, except that the remedies should not be used in more than one-third the strength. An ointment of acetanilide, 5 to 30 grains to the ounce, is also useful here. For the oily seborrhœa of the nose the same remedies and combinations employed in acne and acne rosacea, at first reduced somewhat in strength, are to be advised. Oily seborrhœa is in fact often associated with the milder types of acne rosacea.

TINEA TRICHOPHYTINA (RINGWORM).

Ringworm varies somewhat in the plan of treatment adopted according to the region affected. As the disease occurs upon non-hairy portions of the body, much milder applications are usually sufficient than are employed when the disease is upon the scalp. Upon the bearded region moderately strong remedies are required.

Upon the crural region mild applications may suffice, but frequently the stronger remedies become necessary. Upon non-hairy parts the most frequently used applications are: An ointment of sulphur, 1 or 2 drachms to the ounce; white precipitate or calomel ointment, 20 to 60 grains to the ounce; a solution of sodium hyposulphite, 1 drachm to the ounce; corrosive sublimate lotion, $\frac{1}{2}$ to 2 grains to the ounce; carbolic acid lotion or ointment, 5 to 30 grains to the ounce; painting with tincture of iodine, pure or diluted with alcohol; or any of the various other remedies to be mentioned in connection with the treatment of ringworm of the scalp, except that these should be employed in one-third to one-half the strength there noted.

Upon the bearded region the same class of remedies is employed, and of about the same strength as above mentioned—made stronger in obstinate cases. Two good plans of treatment for the disease in this region consist of the conjoint use of a corrosive sublimate lotion and the application of one of the mercurial ointments above noted, or an ointment of oleate of mercury, 5 to 20 per cent. strength; the other plan consists of the conjoint use of the lotion of the sodium hyposulphite with the sulphur ointment. The lotion is applied, somewhat weakened, to the whole bearded region in order to prevent the infection of new areas, and to the diseased areas themselves it is applied in the above-prescribed strength, and, after drying, the ointment is well rubbed in. These applications should be made at least twice daily. The parts should be washed with soap and water once daily. Along with the medical treatment, extraction of the hairs from the diseased patches is advisable, as this procedure shortens the period of treatment considerably.

In the crural region, the two plans just referred to will also prove valuable, and often curative. In addition to these two plans, the other remedies already referred to may also be tried. In those cases where there is considerable eczematous irritation, a lotion of boric acid, 15 grains to the ounce, with 5 to 10 grains each of resorcin and carbolic acid to the ounce, will serve to allay the more active symptoms. The addition of an insoluble powder to this lotion, such as 10 to 20 grains of calamine and zinc oxide, will prove of distinct advantage in some cases. Painting the parts with tincture of benzoin or myrrh containing 1 to 4 grains of corrosive sublimate to the ounce may be adopted in obstinate cases. In others the parts may be vigorously and somewhat harshly shampooed with sapo viridis for three to ten minutes, then rinsed off and a mild ointment such as advised in eczema applied.

Ringworm of the scalp when once thoroughly established and of some duration is the bane of dermatological practice. Many cases, especially in the earlier weeks of the disease, will respond to almost

any plan, but other cases prove most intractable, months of persevering treatment being necessary to bring about a cure. If the disease is seen in the first few weeks and is limited to one or two patches, a good plan of treatment is to paint on daily the tincture of iodine containing 1 or 2 grains of the red iodide of mercury to the ounce. After several days a variable amount of irritation is produced, and it is then temporarily suspended, during which time any of the mild salves already mentioned may be used. In fact, in such cases any of the ointments alone will often prove sufficient to cure the disease. In the more obstinate cases, or those of longer duration, or those which have had many of the ordinary remedies applied without result, recourse must be had to stronger applications. Of these the most valuable are corrosive sublimate, in the form of a lotion, 1 to 4 grains to the ounce; pyrogallic acid, 10 to 40 grains to the ounce of ointment; naphthol ointment, 1 drachm to the ounce; and chrysarobin, 20 to 60 grains to the ounce. This last remedy may also be used in the form of paint with collodion or liquor gutta-percha, 30 to 60 grains to the ounce. Strong corrosive sublimate lotions should not be employed if the area of disease is very large; it is to be thoroughly dabbed on twice daily. If one of the ointments is selected it should be well rubbed in for several minutes.

Chrysarobin is the most active remedy in our possession, but has the disadvantage of often exciting dermatic inflammation of the surrounding skin as well as disagreeable staining properties. If carelessly used, some of it may be carried to the eye and provoke a conjunctivitis. Its use as a paint is less apt to be attended with those disadvantages than in a salve form, although this latter is probably more effective. The paint is applied twice daily for several days, at least till quite a thick coating is formed or signs of active irritation present themselves. It is then discontinued and a mild salve employed till the crust formed comes off or can be readily picked off. If there is much underlying irritation, the salve is continued for a day or two and the painting then resumed. If chrysarobin is employed as an ointment, it is, like the other salves, to be well rubbed in twice daily, and continued till irritation results, then temporarily set aside and a mild ointment employed. If after a time no improvement is noticed, or if after a time improvement ceases, a new plan of treatment is to be adopted. At the end of three or four weeks it is well to intermit treatment, applying a mild lotion or salve for several days, and then take a survey of the condition.

There remains a method which may be adopted in the extremely rebellious cases, in which the patches are few and distinct: the method of producing an active artificial sero-purulent inflammation with croton oil is referred to. It is a procedure not entirely devoid of danger,

and one which may, especially if carelessly used, be followed with permanent hair loss, and therefore it should not be employed except in suitable and urgent cases. But one area, and that not over an inch in diameter, is to be tried at a time. The oil, at first with two parts of olive oil, is carefully painted on with a fine brush, using a minute quantity. This is repeated twice daily. After two or three days acute inflammation should be excited. If this has not resulted a stronger application must be made use of. After the inflammatory action is aroused, a mild ointment, containing $\frac{1}{2}$ drachm or 1 drachm of boric acid or 10 or 20 grains of sulphur to the ounce, is to be used. As soon as this inflammation has subsided, another patch may be attacked. Occasionally a second application to the same area is necessary. Lactic acid, at first diluted with one or two parts of water, may take the place of croton oil, but it is not so surely effective.

There are certain other procedures in the management of ringworm of the scalp which remain to be mentioned. If the diseased area is large and irregularly distributed it is advisable to have the hair closely cropped over the entire scalp; if there are but a few well-defined patches, then it should be cut very close on and around the patches and be allowed to remain about one-half to three-quarters of an inch long over the remaining portions. This facilitates treatment, and permits the early discovery of any other points of infection. In addition to the application of the stronger remedies to the diseased areas themselves, a general application should be made to the entire scalp to prevent the disease spreading. For this purpose a weak corrosive sublimate lotion, $\frac{1}{2}$ to 1 grain to the ounce, may be used, or a lotion of carbolic acid, 2 to 3 drachms to the pint, or a saturated boric acid solution containing carbolic acid and 2 or 3 drachms of resorcin to the pint. The general application of sodium hyposulphite solution, 1 drachm to the ounce, applied freely, following the next morning with dilute acetic acid or vinegar, giving rise to nascent sulphuric acid, is usually efficient as a preventive and in mild cases curative. Or an ointment of sulphur, 1 drachm to the ounce, may be employed for this purpose.

Another procedure which is of great value is the extraction of the hairs from the diseased patch, as this materially shortens the time of treatment. This cannot be readily done if a large part of the scalp is involved.

As to soap-washing, it is advisable to employ a medicated soap such as a sulphur-naphthol soap. The entire scalp should be washed about every two days, and the lather allowed to remain on for five or ten minutes before rinsing off; immediately afterward the general preventive applications should be made, and also the stronger remedial application to the individual patches or areas.

While ringworm is parasitic and considered entirely local, it is advisable that the patient's general health be looked after. Plain, nutritious food, and tonics such as iron, cod-liver oil, and the hypophosphites are frequently prescribed with apparent advantage.

TINEA VERSICOLOR (CHROMOPHYTOSIS).

The most satisfactory remedies in the treatment of this disease are sodium hyposulphite, a sulphurated sapo viridis, corrosive sublimate solutions, and naphthol ointments. This list could be materially increased; in fact, any of the remedies suggested for the treatment of ringworm will prove efficacious in this disease. Sodium hyposulphite is applied in the form of a lotion, 1 drachm to the ounce; corrosive sublimate as a lotion, 1 to 3 or 4 grains to the ounce; naphthol as an ointment, $\frac{1}{2}$ to 2 drachms to the ounce. The parts affected should be thoroughly treated with the selected remedy; if a lotion dabbing it well on, and if an ointment rubbing it well in. The parts should be washed once daily; in mild cases with ordinary toilet soap, and in more extensive and obstinate cases with sapo viridis.

The best method of treatment in the average case is the conjoint use of the sodium hyposulphite lotion, and the daily washing with the sulphurated sapo viridis. This latter is variously made of from 1 to 3 drachms of precipitated sulphur to the ounce of sapo viridis.

In extremely rebellious cases the parts may be thoroughly shampooed with this soap, the lather allowed to remain on; this process is repeated once daily till a moderate degree of irritation results, when the accumulated soapy applications are rinsed off. If there should result any marked irritation or an unpleasant tightness of the skin a mild salve is to follow.

URTICARIA.

Acute urticaria is usually caused by acute indigestion or the eating of some food that disagrees, or which in the individual, from some idiosyncrasy, acts as a poison. The accepted treatment consists substantially in the administration of a laxative, preferably a saline, and an antacid, such as sodium salicylate, 5 grains three or four times daily, or sodium bicarbonate: this latter especially in children. Many cases of the acute disease will respond at once to a nightly dose of the ordinary calcined magnesia, repeated two or three nights if necessary.

This remedy combines both laxative and antacid properties and is extremely valuable. In urgent acute attacks when the disease involves the epiglottis and throat, with symptoms of an alarming character, an emetic may be administered to get rid of the offending substance in the stomach; the subsequent treatment consisting of a saline and antacids or two or three doses of calcined magnesia.

The most common causes of chronic urticaria are digestive or assimilative irregularities, neurasthenic conditions, and in women functional or organic disease of the utero-ovarian system. In many cases, it is true, the cause is difficult to recognize. Depending upon the etiological factor systemic treatment will vary. Probably, in the majority of cases, antacids with remedies to tone up the digestion, with an occasional saline, will be most fruitful of results. Independently of any assignable cause empirical remedies may be resorted to. Of these the most valuable are belladonna or its alkaloid atropine, sodium salicylate, pilocarpine, ergot, potassium bromide, antipyrin, phenacetin, gelsemium, strychnine, and minute doses of nitro-glycerin. In obstinate cases a rigid milk diet, with relaxation from care and work, will bring about a curative result. In especially obstinate cases a change of air and climate may be advised.

As to the external treatment, ordinarily some domestic application, such as vinegar, a tablespoonful of vinegar to a teacupful of water, and dilute alcoholic lotions, will be sufficient to relieve the irritation pending the action of systemic remedies. In the chronic cases, however, the more active anti-pruritic remedial applications will be required. Of these the best are carbolic acid, 1 to 3 drachms to the pint of water, to which one or two ounces of alcohol may be added with advantage; liquor carbonis detergens diluted with several or more parts of water and gradually strengthened even up to the pure solution; a saturated solution of boric acid, with or without carbolic acid; mild alkaline lotions, 1 to 3 or 4 grains of sodium carbonate to the ounce of water. In extensive cases tepid bran-baths or mild alkaline baths will often give temporary relief. In persistent cases where the relief from these several applications is unsatisfactory, the various other applications referred to in the treatment of pruritus may be prescribed. In those exceptional cases of urticaria in which some of the lesions become bullous, the larger bullæ should be punctured and emptied, and some mild salve such as the oxide-of-zinc ointment applied spread upon lint. Or the lotion may be employed first, allowed to dry, and then the ointment applied.

XERODERMA PIGMENTOSUM.

This disease, also called "parchment skin," and "angioma pigmentosum et atrophicum," is rare. It has been noted to occur in several children of the same family. It appears in the first few years of life. Its most prominent symptoms are numerous disseminated freckle-like pigment-spots, telangiectases, more or less shrinking and contraction of the skin, atrophied muscles, and sometimes minute warts or wart-like lesions—later in its course epitheliomatous growths and ulceration appear. Its course is slow, usually extending over years. Death finally results. There is apparently a congenital predisposition. The disease is probably a degenerative atrophy.

Treatment is palliative, and based upon general principles.

SPASMODIC AFFECTIONS OF THE NERVOUS SYSTEM.

By JOSEPH COLLINS, M. D.

CONVULSIONS OF CHILDREN (ECLAMPSIA INFANTUM).

The name "eclampsia" should, I believe, be reserved to indicate those convulsive attacks which occur during the first two years of life and which are not dependent upon organic disease of the nervous system, but arise from irritation of various parts of the body.

Convulsions the result of slight causes are much more apt to occur in young children than in adults. They are symptomatic manifestations, and the first thing to be done for their treatment is to search for their source and causation.

This search will be greatly facilitated if it be kept in mind that convulsions are an expression of irritation of the motor areas of the cortex or of the convulsive centres in the brain-ganglia, pons, and oblongata, which irritation may be direct and mechanical as from a clot or spicula of bone, or direct and chemical as from the circulation of peccant matter in the blood, or indirectly by the transmission of sensory irritation from some adjacent or distant part of the body, as from the mouth, or gastro-intestinal organs. Convulsions of children might also be considered as of organic or functional origin, but the classification I have mentioned has the advantage that it indicates, in a measure, the way in which they are caused.

After the origin or source of convulsions in infants has been determined there are two things incumbent: one, the removal of the cause so far as possible, the other, the treatment of the attack itself.

Treatment of the Causes.

In some instances it will be possible to remove the cause, for instance when the attack is due to indigestible substances in the stomach and bowels, to cholera infantum, dysentery, constipation, swollen gums associated with the eruption of the teeth, organic poisons in the blood and the urine, such as urea, glucose, etc., but in other instances in which the cause is of an organic nature and the convulsions

are the expression of some mechanical and irritative condition, such as meningeal hæmorrhage, products of inflammation, and new growths in the tissues of the central nervous system, removal of the cause will be impossible, although some measures may be taken for its alleviation.

Of the convulsions of children we are concerned chiefly in the treatment of those that have no organic or focal basis in the central nervous system. I shall therefore make no further mention of the cases that occur with diseases of the meninges and brain, or those that occur as the first symptoms of idiopathic or hereditary epilepsy, and shall consider only those that are sometimes referred to as of reflex origin—meaning by that designation a central manifestation of peripheral irritation.

Convulsions are powerfully predisposed to by hydræmic and other impoverished conditions of the blood, such as occur with rachitis, after acute infectious diseases, etc., and they may occur without any other cause than loss of blood. When any of these conditions can be made out in children with convulsions they should receive particular treatment; in grave cases possibly transfusion of normal saline solution should be performed.

The condition of the buccal cavity and the gastro-intestinal canal should be investigated with great care in every case of eclampsia infantum. Swollen, inflamed gums should not be treated by cutting them, or by giving the patient something to bite on; such measures add to peripheral irritation, which is already excessive to a pathological degree. They should be treated by antiphlogistic applications such as cold to the outside of the face and diluted solution of aconite and iodine locally. If there is reason to suspect the presence of indigestible substance in the stomach a brisk emetic, such as ipecacuanha, should be administered, and then a cathartic. If constipation exists, a clyster should be given. A suspicion of intestinal worms justifies the administration of any of the well-known anthelmintics such as santonin, and saline cathartics, after which the stools should be scrutinized for small worms and sections of tape-worm, and, if these are found, remedies adapted to their expulsion given. Careful examination of the urine and of the blood are of the greatest service, and any deviations from normal which such examinations reveal should be rigorously combated.

When convulsions are apparently excited by hyperthermia, the most beneficent results follow putting the patient in a bath of from 90° to 80° F. and letting him remain there from fifteen to thirty minutes. If this is not feasible the same object can be attained by cold-water ablutions or the application, for a short time, of the cold pack; an ice-bag being placed on the head.

If an adherent prepuce or any other discoverable source of peripheral irritation can be found, it should be corrected as soon as possible.

Convulsions occur very frequently in rachitic children, and when there are evidences of this depraved condition active measures, dietetic and medicinal, should be taken for its cure. Phosphorus, cod-liver oil, arsenic, quinine, etc. may be given for their constitutional effect, and at the same time small doses of valerian or the bromides for their transient symptomatic effect.

A local form of convulsion—laryngismus stridulus, or cerebral croup as it is sometimes called—which occurs almost exclusively in children who are so profoundly rachitic as to present craniotabes, requires particular mention. It comes on with such abruptness and the symptoms soon become so alarming that oftentimes it is necessary to use heroic measures, such as tracheotomy, to spare the child's life. In the ordinary case the treatment required is to lift the child from the bed, throw the head back so that air can enter the respiratory passages with facility as soon as the spasm relaxes, pull the tongue forward, throw cold water against the body, or subject the skin to smart flagellation in order to stimulate the inspiratory centre to take the prolonged inspiration which it always does accompanied with the whoop when the spasm relaxes. If it is possible to make the patient inhale at all, a few drops of chloroform or of nitrite of amyl will quickly terminate the spasm, and whenever they are at hand and can be utilized, this is the treatment to follow. In some instances wrapping a compress wrung out of hot water around the throat and then throwing cold water against the surface of the body is quickly efficacious.

If the spasm is persistent and the child's life is despaired of, there should be no hesitation in opening the trachea to admit the ingress of air, but in cases where the ordinary measures do not suffice to relieve the spasm promptly, it is advisable to give a small dose of morphine hypodermically. This is usually soon followed by a relaxation of the spasm.

Attacks of laryngismus stridulus usually terminate before the physician has time to reach the patient. His duty then is to prevent a recurrence of the symptom. This can be done by the administration of bromides, valerian, asafœtida, etc. for their symptomatic effect, and afterward making use of every possible measure to combat the depravity of nutrition which allows the symptom to occur.

Treatment of the Attack.

When a physician is called to a child in convulsions the urgency of the symptoms, both on account of the parents' comfort and the patient's welfare, does not permit of searching for the cause. On

account of the mortality of eclampsia infantum (10 per cent.) it is necessary to check the severity of the spasm at once. For this purpose, not the slightest hesitancy should be had in using inhalations of chloroform or nitrite of amyl, or a mixture of equal parts of these substances, until the tonic or tonico-clonic spasm (which these convulsions frequently are) begins to subside. After this, search may be made for the cause, and, if it be easily determined, measures specifically directed to its alleviation should be taken. At the slightest evidence of recurrence of spasms the inhalations should be repeated. It is rarely ever necessary to carry the patient into even a slight state of narcosis; a much lesser degree than that produced during parturition is generally sufficient. Domestic measures such as immersing the patient in warm or hot water, mustard baths to the feet, etc., are of very little use, and the time consumed in their application is wasted and ought to be employed in the way that I have indicated. Putting the child in a moist warm pack, with ice to the head, after the first convulsion, will very often prevent a second attack, and so will immersion for a long time in a lukewarm bath.

After the severity of the convulsion has been coped with, or after the attack has ceased at least temporarily, bromide of potassium or sodium in doses to suit the age of the child should be given, and kept up for a few days, while the child is kept absolutely quiet in bed and is placed on the simplest and most easily digested food. If the child is of such an age that it is still nursing, there is of course no reason to change this, except that it should be supplied in small quantities.

Drugs that have repute as anti-spasmodics or anti-convulsives, such as valerian, asafœtida, belladonna, etc., may be given, but, as a matter of fact, if anything else is necessary—a rare event—the most potent of all anti-convulsives, opium, can be used.

When the convulsion is an accompaniment of scarlet fever, measles, pertussis, malaria, etc., as it is sometimes, the measures that have already been mentioned for combating the attack should be made use of, and afterward an attempt should be made to mitigate the severity of the disease. In such cases it is generally the high temperature that is provocative of the convulsion, and it should be borne in mind that hyperthermia, it matters not with what disease it occurs, is most safely and quickly combated by the use of cold water.

TETANY.

Tetany is a toxic neurosis characterized by the occurrence of intermittent, recurring tonic spasm in the muscles of the hand, and sometimes in other parts of the body such as the foot, which causes it

to assume a position similar to that of the accoucheur when he makes a uterine examination; increased mechanical irritability of the motor nerves (Chvostek's symptom); increased electrical irritability of the motor nerves (Erb's symptom); increased mechanical and electrical irritability of the sensory nerves (Hoffman's symptom); and by the occurrence of the cramp condition when deep pressure is made, as by the finger on the extremity wherein the spasm has been manifest (Trousseau's symptom).

Tetany is due to, or follows, many very different infections and intoxications. As the treatment of the disease depends very largely on the etiology it is necessary to make brief mention of the causes. It may be caused by the activity of peptotoxins, intestinal toxins, the toxins that accumulate in the system after ablation of goitre, and by poisons generated during the course of any of the acute infectious fevers. It is sometimes caused by ingestion of one of the vegetable or mineral poisons, such as ergot, alcohol, chloroform, lead, phosphorus, etc. It occurs with conditions of bodily depravity such as are induced by pregnancy, with such disorders of nutrition as rachitis, and sometimes the only attributable causes are hygienic and dietetic errors. In all probability the seat of the lesion or the manifestations of the peccant activities of the poisons is the central nervous system, with sometimes a predilection for the brain, sometimes for other parts.

Treatment.

The treatment of tetany is first to discover the cause, render it non-operative, and if possible to get rid of it. This is not always an easy thing to do. For instance, cases of tetany which develop with stomachic dilatation are almost always associated with chronic ulceration near the pylorus, which requires assiduous and long-continued treatment before the disease begins to subside; but this is the most fatal form of tetany—from one-half to two-thirds of the victims succumb—while the ordinary forms of tetany not infrequently go on to recovery even if no treatment is instituted. After the causes of the disease are combated and removed, measures should be taken to prevent further impoverishment of the blood and to restore it as soon as possible to a normal condition.

When the disease occurs epidemically, the victims should be isolated, not on account of nervum contagiosum, but because the evil effects of imitation on a well child may be considerable.

The treatment of the cramp condition itself may summed up in few words: The physician's efforts should be to allay pain and to arrest muscular contraction. The medicines that have been found most useful for these purposes are a combination of chloral and belladonna or chloral and bromide. In very severe cases the administration of

hyoscyamine and curara by means of hypodermic injection may be necessary. As a rule, the first-mentioned measures, if associated with prolonged lukewarm baths for their sedative effects upon the peripheral sensory nervous system, revulsive and stimulating applications over the spine, and light rubbing of the extremity with sedative liniments will be quite sufficient.

The use of quinine, opiates, valerian, anti-rheumatics, etc. should never be indulged except to meet special indications, and then they are to be employed only as symptom-medicines. The same may be said of the administration of the bromides: they should never be given except for a few doses, as their action upon the blood is one that should not be courted in a disease that is in part the effect of blood-depravity.

The galvanic current can often be used with great efficaciousness: the cathode on the back of the neck or chest, and the anode on the nerve-trunk which supplies the parts which are the seat of the spasm, and a current of considerable intensity allowed to flow for several minutes. This procedure may be repeated twice or three times a day. It does not need mention that the faradic current is to be avoided, as it would aggravate the symptoms exceedingly. The liability to the occurrence of this disease should always be borne in mind when operations on the thyroid are advised, and whenever possible the surgeon should be counselled to do a resection rather than an extirpation. When the symptom occurs after operation on the thyroid, transplantation of thyroid as well as thyroid-feeding may have to be employed.

When the disease occurs in pregnancy, measures taken to combat the hydræmia may be sufficient to cope with it, but occasionally the severity of the symptoms becomes so great and their occurrence so frequent that measures taken to terminate the pregnancy must be considered.

There should be no hesitation in insisting upon weaning the child at once when tetany occurs in nursing mothers, not alone for the sake of the mother, but for the welfare of the child.

When the disease occurs in young children and no cause for its appearance is to be determined, it is well to bear in mind that the symptom-complex sometimes follows the hydræmia produced by intestinal worms, and that a few sharp doses of some anthelmintic will start these patients toward recovery.

In very rare instances the tonic spasms are so severe and so widespread that symptoms of asphyxia appear, and, if such a state should occur, inhalations of chloroform to relax the spasm must be given.

The convalescence of patients who have had tetany is often tedious and calls for the most assiduous dietetic and hygienic supervision.

Infantile tetany is a dangerous and often fatal disease. It occurs

in an active and a latent form and always calls for prompt treatment. The digestive tract should be carefully examined and undigested substances in the stomach removed by lavage, followed by a brisk cathartic. The usual measures for the treatment of tetany may then be given.

CHOREA.

The term chorea means literally a dance; it is commonly and properly applied to the disease which has so long been known as St. Vitus' dance. It is a term, however, which has been greatly abused by some writers, who apply it to a number of affections—particularly the ties, of which irregular dance movements are a striking feature. The term chorea, without modification, should be limited to designate a humoral affection which occurs almost exclusively in an acute form—usually before puberty for the first time; a self-limiting disease which runs a rather typical course, characterized by involuntary, uncontrollable, abrupt, bizarre, dancing movements of the extremities, of the face, and sometimes of the trunk; motor unrest; amyosthenia, and mental sluggishness.

Eponymic nomenclature in the medical sciences should always be frowned at and discouraged, for it usually indicates ignorance or selfishness. Sometimes, however, such nomenclature fulfils a definite purpose and becomes a help: it is so in chorea; and to refer to Sydenham's chorea, Dubini's chorea, Bergeron's chorea, and Huntingdon's chorea is to refer to four distinct and separable diseases, all of which have in common dancing movements to which the term chorea is properly applied. The first, however, is a humoral disease and occurs when certain conditions of dissociation take place in the blood; the second is an infectious disease; the third is probably the outward manifestation of a general neurosis; and the fourth is a purely degenerative disease of the central nervous system, and has absolutely nothing in common with ordinary chorea except that both have involuntary, bizarre, dancing movements. Each of these forms will be referred to separately in speaking of the treatment, while the conditions variously denominated hammering chorea, laryngeal chorea, diaphragmatic chorea, chorea festinans, chorea procursiva, saltatory chorea, gesticulatory chorea, and so on to a most discouraging number, will be considered where they belong—under the Ties. Sydenham's chorea probably always occurs as the indirect result of certain dissociated conditions of the components of the blood. These are often directly conditioned by rheumatism, pregnancy, exhausting diseases and habits. Directly, the symptom-complex is often prompted into

being by psychical trauma, such as fright, acute worry, highly wrought anticipation, and reflexly from gastro-intestinal irritation such as that excited by the presence of worms, and very rarely from strain of highly endowed special sense-organs such as the eyes.

The significance of the occurrence of an attack of chorea is more than mere tenure of the symptom-complex indicates. In the first place the disease occurs more frequently in those whose heritage is neuropathic, in those whose rearing has been contributory to defective inhibition of passions and appetites, and in those who are unamenable to disciplinary measures of the nursery. An attack of chorea, be it ever so slight, in a way points to the existence of a neurotic diathesis and indicates that the possessor is more honestly entitled to succumb to the harassments of life than are his more stable fellows. A knowledge of this should make the treatment more far-reaching than through the weeks during which dancing movements are present.

Treatment.

The treatment of an attack of chorea may be considered under three heads:

(1) Rest and the preservation of nutrition;

(2) Medicinal treatment;

(3) Mental and bodily hygiene.

If the treatment of an attack be carried out with the necessary attention to each of these three requirements the vast majority of choreics will recover without sequelæ or permanent injury to the nervous system. As a matter of fact the reason why chorea leaves its impress upon the nervous system so often is that most physicians content themselves with giving medicines alone, which, if not least important, is not of more value than the first and not much more than the last. Chorea is, like rheumatism—the disease which it resembles and which it often follows—a self-limiting one, and if the patient is placed under favorable auspices he will recover in a period varying from eight to sixteen weeks.

The importance of *rest* in contributing to the early termination of the disease cannot be overestimated, nor can the carrying out of it in the first part of the disease be overdone. It is very difficult to get little patients to remain in bed all the time, but a compromise can usually be affected by having them arise late, go to bed for an hour or more in the afternoon and retire early in the evening. Many of them are in a run-down, mentally overwrought condition, the result of persistent study, attendance at school, improper nutrition, etc. Consequently rest and freedom from all sorts of excitement is the most rational prescription. As has been hinted, it is most important that rest, freedom from motor activity, be obtained in the afternoon, if

possible, for it is at that time in the twenty-four hours when destructive metamorphosis of the bodily tisues goes on with most activity, and to counteract this is the great desideratum. The question of taking the patient from school should always be answered in the affirmative, and after an attack there should be no haste in the resumption of school duties, particularly if they are at all trying and if participation in them be attended with any great strife, such as is fostered by the reward-of-merit system in many of our schools. The mental discipline and bodily hygiene of these patients must be carefully attended to after an attack of chorea, with the view to avoid a second attack and to prevent a tendency or disposition to nervous affection.

The *nutrition* of the patient is to be fortified by the administration of digestible and assimilable nutrition in small quantities, repeated with moderate frequency, and for this purpose an ordinary mixed diet with a relatively smaller proportion of animal proteids is most useful. If the child has not yet reached the age when a mixed diet is usually given, absolute restriction to a milk diet should be insisted upon.

I have found that one of the best measures in contributing to the maintenance of nutrition and at the same time to the quietude and comfort of the patient, is the shock and counter-irritation of cold water poured from a height or thrown forcibly against the back of the neck and spine once or twice a day. I have also had the most salutary results, when the motor unrest is very great, from the use of the wet pack, especially before retiring. It is not only soothing to the patient but contributes to refreshing sleep. For this purpose it is more serviceable than hypnotics and has the advantage that it has no after-effects except gratifying ones. After the first one or two applications children do not rebel against it; in fact, they enjoy it.

Drugs.—The medicines that are of service in chorea are few in number. This bespeaks their real value. If no one medicament were of signal value, the number which might be recommended would be legion. The three drugs which are of real service in the treatment of an attack of chorea are arsenic, exalgine, and quinine, and their relative value is indicated by the order in which they are mentioned. This enumeration does not of course include such medicines as iron, which is an integral part of the blood and which it is necessary to give in nearly every case of chorea.

Arsenic is by far the most efficacious therapeutic substance to influence the severity and course of an attack. It may be given in the shape of Fowler's solution preferably, or the arsenate of soda. It can be given in comparatively large doses, even to the production of slight toxic effect such as puffiness around the eyes, nausea and vomiting, lachrymation, etc., but as soon as these symptoms appear

administration of the drug should be withheld until they cease, then the drug should be given again, in the same dose that was being given when the toxic symptoms occur. It will be found that the patient tolerates the renewed attempts at the large doses without any complaint. The dose of Fowler's solution for a child of from six to ten years may in this way be brought up to from 10 to 15 drops in a few days. Personally, I have rarely given the extremely large doses recommended by Seguin, nor do I think that they are necessary. When the choreiform movements are of great severity and when they do not promptly subside under the administration of arsenic, and the influence of enforced rest, I have not failed to get the required effect from a few doses of exalgine.

Exalgine has never, apparently, been very extensively used in the treatment of chorea, yet it is a potent medicine to abbreviate the duration of an attack. It may be given in doses of from ½ to 3 grains to children under ten years, and repeated three or four times a day. The effects of the administration of exalgine, not only on the severity of the symptoms but upon the patient's appearance and vitality, are generally manifested very promptly, and to one unaccustomed to its use the latter, if the drug has been given in large doses, may make him somewhat solicitous. The hæmolytic action of exalgine is responsible for the early appearance of anæmia, and this, as well as the direct effects which it has on the circulatory apparatus to lower blood-pressure, sometimes produces a condition akin to collapse. The occurrence of these symptoms can in a large degree be prevented by administering some soluble salt of iron very freely from the very beginning of medication. I have not seen bad results follow the administration of exalgine, although in cases that have been unamenable I have carried the quantity of exalgine administered up to 30 grains in twenty-four hours, at the same time administering most liberal doses of iron. It may not be amiss to remark that when the drug is given in extremely large doses epileptoid convulsions may occur. Naturally the greatest care must be taken to avoid any such occurrence. To secure the beneficial effects of the drug it is never necessary to give it in doses approaching those required to produce these serious symptoms.

Exalgine is of greater service in the very acute cases than those that have lasted for some time, and it can often be used to advantage in the beginning of an attack, and arsenic later. Were it not for the profound anæmic and collapse symptoms which it causes—for which, as I have said, iron, and sometimes digitalis must be administered—the drug could be recommended more warmly than I think fit to do.

Quinine, the *salicylates*, and *antipyrin* have all been very largely used in the treatment of chorea, and frequently with the most satis-

factory results. It is supposed that they owe their beneficial effect to their action on the blood, it being well known that they have a direct action on the white corpuscles and the blood plaques, and by contributing to intestinal antisepsis. Speaking in broad terms, intestinal antisepsis is a myth, and should be considered in mythology, not in therapeutics. Their administration is recommended, in becoming doses, in cases in which it does not seem wise to administer either arsenic or exalgine, and particularly in cases where there is a distinct rheumatic history.

Dana has recommended anodal galvanization through the skull, but this procedure has apparently not been adopted, nor have I met a case in which I deemed it necessary to use it.

A combination of chloral and bromide is often of service when the motor activity is extreme and to aid in securing sleep, but, if the wet pack be applied and the discipline of keeping the patient in bed be pressed into service, there will rarely be any need of using the chloral-bromide mixture. I have had most satisfactory results from the use of the bromide of zinc in cases of long standing, particularly in those cases where the patient has run the therapeutic gauntlet before coming under observation. It may be given in doses of 5 to 20 grains three times a day.

Occasionally the administration of some preparation of belladonna or hyoscyamus, especially in cases where the vesical sphincter is derelict in the performance of its duties, is of advantage. Measures must often be taken to overcome constipation, which the profound asthenia of chorea is directly contributory to, and which the administration of iron increases, and the appetite must be prodded.

The *mental disturbances* of chorea have been the subject of considerable writing. Except as a part of the asthenia of the *soma* and the *psyche* mental disturbances do not exist, and such symptoms of mental impairment as aphasia, forgetfulness, or intellectual sluggishness require no treatment apart from that taken to combat the general weakness. It should be borne in mind that all the functions of the organism are perverted in this disease in the same manner as in rheumatism, and the patient should be treated accordingly.

A severe form of Sydenham's chorea occasionally occurs with *pregnancy*. It demands active and vigorous treatment from the start, otherwise it will result in such a condition of bodily weakness that the patient will either abort spontaneously or the necessity of terminating pregnancy will become paramount. In these cases there is no difficulty in putting the patient to bed as there is so often in the case of young children, and this as well as the arsenic plan of treatment should be thoroughly carried out. If the severity of the symptoms is mitigated promptly the patient may be allowed to go about,

and the prospects are that complete recovery will soon follow. If the symptoms are so severe that the life of the patient is in jeopardy there should be no hesitation in removing the contents of the uterus.

Chorea of *adult males* occurring for the first time is an extremely rare condition, and does not call for specific mention in regard to its therapy.

The subacute type of Sydenham's chorea very often requires a plan of treatment not unlike the rest cure so often beneficial in cases of neurasthenia the result of overwork. In fact, the rest cure, or a modification of it to which is added the use of arsenic, is the treatment advised. Bromide and chloral have no place in the therapy of the disease other than to combat symptoms, and are never to be given for any length of time. Iron, arsenic, zinc, antipyrin may be given internally, and various forms of electrical and hydriatric treatment externally; but permanent amelioration, even, cannot be promised from any one of them. Sometimes the actual cautery to the back of the neck and vertebral column has seemed more efficacious than anything else at the Post-Graduate clinic.

This form of chorea should not be confounded with chronic degenerative chorea: the former is an eminently curable condition, while the latter always goes on to mental decay and eventually physical dissolution.

One attack of chorea predisposes to another. This should prompt the physician to take measures to prevent a relapse, and particularly in the spring and summer, when the majority of cases occur. Attention to the general nutrition, proper use of gymnastics and massage, interdiction of excessive mental application, and intelligent mental and physical discipline will go far toward placing the patient beyond the danger of relapse.

The infectious disease which Dubini described in 1846 under the name of chorea electrica, and which is now usually referred to by his name, is confined almost exclusively to northern Italy, and is a very fatal disease, at least 90 per cent. of cases terminating in death. No treatment has yet been suggested that diminishes that frightful mortality.

The disease known as Bergeron's chorea, also sometimes associated with the name of Henoch, occurs in nervous anæmic patients of neuropathic heritage. It is sometimes apparently attributable to fright, excessive emotion, etc. It is more properly considered as a form of generalized tic. It develops quickly and abruptly; the choreiform movements are of an electric nature, most often in certain muscles, as of the face, the neck, and the shoulders, and are often accompanied by symptoms referable to the stomach, indicative of distention and

of rhythmical movements in its walls. The symptoms cease during sleep.

The treatment is the administration of an emetic and measures taken to assist the stomach to properly functionate, and general tonic measures to facilitate the return of perfect nutrition. Huntingdon's chorea, a degenerative disease of the entire nervous system, of a familiarly nature, is neither prevented nor benefited by treatment. The mental defects which its victims develop demand hospital treatment.

PARAMYOCLONUS MULTIPLEX.

Paramyoclonus multiplex is the name given to a form of myoclony which was first described by Paget as a form of chorea electrica in 1847, but which is associated now with the name of Friedreich, he having described it anew and with great detail in 1881. Paramyoclonus multiplex occurs usually in adult life, most often in those of neuropathic inheritancy, and is characterized by the occurrence of abrupt, involuntary contractions similar to those produced by an electric shock; these may be somewhat localized in their manifestations, but never systematized or rhythmical, and they are repeated at variable intervals. The myoclonus is the striking symptom, but it is not the only one, for almost all suffering with this disease have symptoms of a mild form of melancholia, neurasthenia, or hysteria.

The disease is of uncommon occurrence in this country.

Paramyoclonus multiplex forms one of the members of the class of false chorea, of which variously described forms of electric chorea, such as fibrillary chorea, chorea of Bergeron, of Henoch, etc. are close relatives, of degenerative types. The term myoclonus is often very properly used to cover them all.

Treatment.

The treatment of paramyoclonus is, first, treatment of the neuropathic state; and second, treatment of the tonic, clonic, or fibrillary contractions by which it is manifested.

It is unnecessary to detail here, even if space warranted it, the methods that may be employed to combat the first. Hydrotherapy and massage have of latter years been extensively used to overcome the functional nervous diseases. Paramyoclonus multiplex is one of the diseases in which neither baths nor the douches seem to have any beneficial effect. The most important measures in the treatment of the general condition are those taken to maintain bodily nutrition and strength, and those to circumvent mental introspection and depression. A methodical tonic, hygienic course of treatment will fulfil the first

requisites, but the latter is not so easy. The very nature of the disease and its chronicity prevents travel, sports, amusements, and the relaxation to be obtained from them, and often institution-treatment such as offered by a thoroughly equipped sanatorium is advisable.

Of the measures that can be taken to relieve the severity and frequency of the material manifestations, the first place is held by electricity and the second by hyoscyamus, neither of which, however, is specifically curative. When cure results in these cases, it is from the combined effect of general hygienic, dietetic, and tonic measures, associated with active treatment by the physician.

Electricity is best applied by means of central galvanization, one electrode being placed over the spine and the other on successive parts of the member in which the clonus is manifest; generally the upper or lower extremities are involved, although the face may be affected. Often striking amelioration is the result of careful, persistent electrical treatment.

Hyoscyamus may be given internally or hypodermically in the form of hyoscine hydrochlorate; it should not be kept up for any considerable time, as the effects of it are demoralizing to the integrity of general nutrition. Any form of hypodermic medication is to be avoided in patients ill with functional nervous disease, and this disease furnishes no exception to the rule.

On account of their proven efficaciousness in true chorea, arsenic, quinine, and antipyrin have frequently been recommended. Their administration may sometimes be indicated to fulfil particular purposes, but, all in all, they have no place in therapy of the disease other than as symptom-medicines.

Drugs that are of repute in the treatment of hysterical affections, such as the valerianates, zinc salts, etc. do not seem to have the slightest influence on the course of this disease. The subcutaneous administration of atropine and cocaine is mentioned only to be condemned.

In a general way it may be said that the great majority of sufferers from paramyoclonus multiplex will either completely recover under the plan spoken of, or they will have the severity of their symptoms so mitigated that they are very comfortable.

LOCALIZED SPASMS AND GENERAL SPASMODIC AFFECTIONS KNOWN AS SIMPLE AND CO-ORDINATED TICS.

The name *tic* is applied to an abrupt, lightning-like contraction of individual muscles or groups of muscles which act together to

fulfil some physiological purpose, reproducing in an exaggerated form some physiological act. Any such movement, it matters not how slight or how extensive, varying from the slightest blinking movement of the eyelids up to the most complex co-ordinated movements associated with obsession and apparent manifestation of psychical activity, may be considered a tic. Tic is a special form of myoclonus, and clinically it is comparable to other forms of myoclonus such as paramyoclonus multiplex and chorea electrica, although genetically these diseases may be different. They are properly considered as the expression of a degenerative neurosis, and the tendency to their occurrence is often clearly inherited.

The simplest forms of ties, whether of the face or the extremities, are so closely imitative of some familiar purposive movement, such as blinking, sniffing, hemming, etc., that they are frequently referred to as habit choreas or habit twitching. Such a reference may be of some service to indicate that they develop occasionally after long-continued purposive or imitative repetition, but if the use of such a term carries with an expression of opinion that this is their only cause it is to be deprecated.

Ties may be classified as—

1. Simple, localized tic, which may include simple twitching movements of the various parts of the face, such as the eyelids, the side of the face, the ala of the nose and the corner of the mouth, tissues, spasmodic wry neck, twitching of an individual muscle or group of muscles of an extremity; and twitching, spasmodic movement of the diaphragm, which forms a variety of what is sometimes described as respiratory spasm.

2. Generalized Tic.—These ties include not only the cases of electric chorea that we have referred to, but also those cases in which the tic is more or less universal in its distribution and the movements are not co-ordinated.

3. Psycho-motor tic, of which there are to be distinguished two distinct types: first, one in which the movement is the motor response of some distinctly formulated idea or thought, usually called an obsession; and, second, a complex co-ordinated tic (*tic co-ordiné* of Gilles de la Tourette), a more or less generalized tic frequently coupled with the production of definitely articulated sounds and words or rapid repetition of words, recurring utterances which are expressive of the feelings or emotions and not of cognitions or thoughts. When they assume the form of recurring utterances they are called echolalia; when they are filthy and obscene, as they often are, they are termed coprolalia.

Varieties of this affection have been described in different parts of the world under different names: in the Orient as *latah*, in Russia

and Siberia as *myriatchit*, in Canada and Vermont as "the jumpers," and in general as "saltatoric spasm." *Tic convulsif* is apparently becoming the universal designation.

Treatment.

The treatment of the neurosis of which the tic, its various manifestations and psychical equivalents are an outward expression is one of the most unsatisfactory tasks that the physician can set himself. The treatment of all the degenerative neuroses requires great therapeutic tact and fertility of resource, but this one above all others calls for their possession in a high degree.

Simple Tics, or Localized Spasms.—*Trismus and Facial Spasm.*—The simple tics of the face are never painful, and are annoying largely from an æsthetic point of view, and can often be combated if the treatment is begun early and adhered to. In every case of blinking and twitching of the frontalis and corrugator supercilii the refractive state of the eyes should be carefully inquired into, and if defects are found they should be corrected. If the patient be a child it should be removed from school for a time and encouraged to voluntarily restrain the movements. In some cases the discipline of partial isolation is of service. As a general rule, however, the best results will be obtained by making the patient lead a rollicking out-door life while at the same time a course of tonics and iron is administered, and those who come in contact with the sufferer are instructed to take no notice of the movements. Intimidation, recommended by Trousseau, should never be employed. In some instances instillation of cocaine into the eye and the internal administration of belladonna may be serviceable for the temporary relief of the condition, and will make an impression upon the patient.

Convulsive twitchings of the muscles of the face occur almost always in mature and late adult life, and to treat them satisfactorily one must make a diligent search for the cause and remove it if possible. In some instances twitching in the musculature of the seventh nerve is reflexly produced by irritation of some branch of the great sensory nerve of the upper part of the body, the fifth, and in every case an examination for such a source should be made. The organs of special sense, the teeth, and the condition of the nerve itself should be passed in review. Individual patients will recognize that the tic is aggravated by certain mental and physical conditions, which they soon learn to avoid, and which the physician should take cognizance of.

The general health in many patients who have facial spasm is materially impaired, and oftentimes measures directed to increase of nutrition and physical strength will materially improve the

patient. In some cases occurring in late adult life evidences of arterial degeneration are to be detected, and in one such case under my treatment I have had very happy results from the administration of nitro-glycerin. Almost every drug and measure that has ever been reputed to have any anti-spasmodic virtue has been tried for the relief of this annoying trouble, but there is very little encouragement for the selection of any one of them over all the others. The hypodermic use of morphine will relieve the twitching temporarily, and it has been recommended that the patient should be kept under the influence of the drug thus administered for a prolonged time. There is danger in such procedure, and the patient can never be promised that the cessation, which it rarely ever fails to cause, will be a permanent one. The danger of contracting the habit is enormous, and the disease is infinitely to be preferred to the latter. Injections of strychnine in moderately large doses directly into the seat of the twitching I have sometimes found of service. I have never seen any benefit from conium, which is sometimes very useful when given in large doses in spasmodic torticollis, nor from gelsemium. The most serviceable nervine or combination would seem to be a combination of arsenic and belladonna given in doses sufficient to produce slight physiological effect and kept up for a long time.

Electricity in the shape of the galvanic current (the negative pole at the back of the neck, the positive pole immediately in front of the ear, and a current of two or three milliampères allowed to pass for from ten to fifteen minutes) occasionally lessens the severity of the twitching while its administration is kept up; permanent benefit is not often attained from this, but it may be used as an adjuvant to other measures.

Stretching the facial nerve has been done many times. Anything short of a surgical operation and thorough stretching is not of the slightest effect and even then the results of the procedure are not very encouraging—the cases almost always relapse after a variable time. Occasionally, when the tic is very severe and no amelioration can be got from other measures, this procedure should be resorted to, and active treatment be kept up afterward even though the twitching has entirely ceased.

Occasionally, temporary relief is obtained by a small blister behind the ear, by pressure on one of the larger branches of the facial nerve where it comes to the surface on the face, and by the application of the actual cautery to the back of the neck, but the most satisfactory results can be expected from a persistent effort directed to improvement of the general tone and nutrition and the symptomatic administration of nerve-sedatives.

In several cases of facial tic associated with *nuchal tic*, spasmodic rotatory and lateral *torticollis*, I have seen prompt amelioration follow suspension of the patient from the head by means of the head-piece of the apparatus constructed to suspend tabic patients, and practically the same as that used by the surgeon in applying the plaster corset-splint.

Suspension is oftentimes an important alleviating measure in the treatment of idiopathic torticollis, it matters not in what direction the movement be, whether lateral, backward, or rotatory. Associated with the hypodermic administration of atropine in large doses or of fluid extract of conium by the mouth, sixty drops in twenty-four hours, it often secures complete relief. Naturally such conditions are liable to relapse, and this should be guarded against by the administration of arsenic, quinine, and iron, and the symptomatic use, if necessary, of hyoscyamine, gelsemium, chloral, and bromide. The galvanic current has about the same chance to give relief in this affection as it has in facial tic. It is never more than an adjuvant. Massage, however, is often of real service. In extreme cases resection of the spinal accessory nerve and of the posterior branches of the upper four cervical nerves has been resorted to with fairly good results, but partial section of the sterno-cleido-mastoid muscle is to be preferred if surgical measures are necessary.

The general treatment of *tic of the legs*, the so-called "spring-halt tic" does not differ from that of any of the other simple tics. On account of the facility with which the cold pack can be applied to the extremities, and the soothing effect which it oftentimes has, the local treatment can be carried out with better chances of relief. This is the most efficacious of hydriatric procedures for this condition, but sometimes a warm douche against the parts, and kept up for a long time, will be of service.

Spasm of the respiratory muscles and *tic of the diaphragm*, which are most commonly associated with the production of a loud explosive sound—such as "heim"—repeated from ten to thirty times a minute or oftener are happily not frequent. Two cases that have been under my care during the last few years have proved entirely unamenable to every form of treatment. In one of the cases where the sound was so loud that it could be heard all through the house, the patient was kept under the profound influence of opium for several weeks without the slightest benefit. She was then isolated and put on a tonic plan of treatment; this not being followed by any results, gradually increasing doses of dilute hydrocyanic acid and afterward hyoscine, were given, and so on until every conceivable therapeutic measure was tried, without the slightest benefit. All treatment was then given up, the patient was studiously neglected and sent into

the country, but the results were always the same. After nearly three years' duration the attacks suddenly ceased while the patient was taking large doses of copper.

Convulsive Tics; Co-ordinated Tics.—Treatment of psycho-motor tics should be directed particularly to the development and maintenance of mental equilibrium. This cannot be attained by the utilization of any one measure; the various therapeutic procedures —such as hydriatric measures, exercise, occupation, change of surroundings—must be combined with disciplinary measures of isolation, regularity, and obedience. In the simpler forms of the disease, such as rolling upward movement of the eyes in rapid succession, or quick successive tappings of the toes or the fingers, or quickly repeated movements of the head toward one side, all in response to some formulated idea, I have been successful in some cases by the utilization of these measures and at the same time the employment of mental suggestion after the patient had been carried into a state of mental receptivity that such suggestion was not spent on barren soil. In one case I first suggested to a patient who had compulsory movements of looking toward the horizon to substitute for these a movement of pressing the toes against the sole of the boot. After this was accomplished I suggested that he should have the mental accompaniment of such a movement without the actual muscular contraction. After he became convinced that this was possible it was easy to dispel them altogether.

The severer forms of psycho-motor tic are usually incurable and we must be content to secure amelioration. Some benefit may at times be derived for almost any one measure, such as hydrotherapy, central galvanization, rest in bed, isolation, etc., but the greatest benefit is to be expected when these are combined and when they are accompanied with intelligent disciplinary measures directed immediately to the mental sphere.

In some cases of generalized tic in which the convulsive movements are neither co-ordinated nor accompanied by psycho-motor explosions, much benefit is to be derived from careful persistent treatment, medicinal and gymnastic. In some of these cases it is seen that the convulsive movements do not occur during the performance of some complex purposive acts, and by this I mean acts that have not become so completely involuntary as walking and the like. For such cases regular methodical work in a gymnasium, with persistent practice of exercises requiring careful co-ordination, absorbing occupations such as bicycle riding and learning to dance may be essayed, and sometimes with benefit. In one case of severe generalized tic now under observation I am sure that a patient has derived marked benefit from patient and long-continued trials to learn to ride

the bicycle, from indulgence in this form of exercise since then, and from the internal administration of nitrate of silver. The latter drug given in from $\frac{1}{8}$ to $\frac{1}{4}$-grain doses, is, I believe, one of the best alteratives in this neurosis. Its administration should be alternated with salts of gold and of copper, and of the iodide of potassium.

EPILEPSY.

Before discussing the treatment of epilepsy it is necessary to be explicit about the forms of this neurosis. The symptom epilepsy has been variously classified according to its origin, its etiology, the time of life at which it appears, its symptomatology, its purity, and its complexity. Clinically, epilepsy is divided into *petit mal*, *haut mal*, psychical epilepsy and epilepsy procursiva, periodical sleep-seizures of an epileptic nature, etc. Such a classification is of service to illustrate types of the disease, but it is of no aid in determining a plan of treatment. The neurosis epilepsy, it matters not what clinical form it assumes, predicates, if I may be allowed to project the theory, a similar diseased condition in all cases, it matters not what the outward form or manifestation of the disease may be, and requires practically the same treatment. The division of epilepsy into organic and functional is a convenience. If our theory of epilepsy, a theory now supported by many scientific pathological demonstrations, is correct, this division is necessary until we are able to refer the symptom epilepsy to a firm anatomical basis. In truth, a modification of the division of epilepsy into organic and functional is a most serviceable one.

In discussing the treatment of epilepsy I shall describe, first, the form of epilepsy that occurs before the age of maturity, generally manifesting itself before the time of puberty, without direct causation except what may be attributed to heredity, to consanguinity, parental vice, and to some non-sufficient exciting cause such as fright, great anxiety, excessive mental application, etc. This is the kind of epilepsy to which the name idiopathic has been given, in lieu of a more accurate term to indicate its causation. At the present time these cases are referred to as hereditary epilepsy, primary epilepsy, idiopathic epilepsy. Just what proportion of all epilepsies this form constitutes, it is difficult to say. I feel sure, however, that unquestionably the great proportion of all cases of epilepsy that develop before puberty are usually placed in this category, but it does not include very many, or, better said, any considerable proportion, of the epilepsies that develop after the period of maturity. To be more

explicit, it is impossible to say just what proportion of cases of epilepsy that develop before the age of puberty is associated with congenital and acquired defects which are either so slight, or have been so compensated by a process of repair, that no manifestation except epilepsy is present; and, on the other hand, how many are dependent upon defective development of the proton, upon congenital and post-natal developmental shortcomings.

In the vast majority of cases that develop after maturity epilepsy is a symptom of some organic disease of the brain. Year by year the cases of purely congenital "idiopathic" epilepsy are becoming fewer, while the category that embraces epilepsies due to encephalitic conditions, injuries, and cerebral infantile epilepsies is becoming more comprehensive. The epilepsy that is termed organic is known, when the organic processes are limited and focal, as Jacksonian, cortical, or focal epilepsy, and when the organic process is not focal or localized as general epilepsy. It needs to be emphasized that the term Jacksonian, as generally used, does not apply to the process, but to the clinical manifestation.

Jacksonian Epilepsy.—The focal organic epilepsies occur most frequently in adult life, except when they are the expression of new growths, post-meningeal cicatrices, meningeal and cortical hæmorrhages, and other accidental conditions which may occur at any time after birth. In adult life this form of epilepsy is most frequently the expression of traumatism to the skull, setting up localized pathological changes, gummatous meningitis of the convexities, leptomeningitis, endarteritis, localized gummatous formations, or all or some of these lesions combined, constituting cerebral syphilis. Naturally, the same factors that we have mentioned as causative of organic epilepsy in the child may be operative in the adult and result in similar conditions, and will be manifest by symptoms of the same type and form.

Reflex Epilepsies.—Epilepsies that are symptomatic of some form of central or reflex irritation are not common. Such epilepsy may result from irritation of areas of the brain which are not considered strictly motor, from hydrocephalus, from toxæmic conditions such as uræmia, diabetes, and absinthe. On the other hand, a similar epilepsy may be the result of some form of peripheral irritation, and particularly from irritation of some special sense or highly endowed organ of tactile sensibility, such as the sexual organs. I believe that this brief statement represents all that need be said of so-called peripheral epilepsy, but, for fear of misconstruction, I desire to say that the epileptic manifestation which may follow continued irritation of some peripheral sense-organ is in no way a disease comparable to primary, to congenital, to organic epilepsy, or even to a toxic epilepsy. As I

construe it, the epileptic attack or attacks which result, very rarely it must be said, from peripheral irritation are probably a clinical manifestation of a genuine neurosis, or of a general neurotic condition, which, however, might not display itself by convulsive phenomena if the peripheral irritations did not exist.

The reflex epilepsies should not be considered in too great detail, even to deny their more than rare occurrence compared with the entire number of epilepsies in which no cause can be discovered. Their consideration by enthusiasts and "faddists" has already done immeasurable harm, and the past history and literature of reflex epilepsies, as well as the makers of such histories, deserve to be speedily forgotten. No honest, properly trained physician ever fails to completely examine a patient, and, if he discovers a condition of the foreskin that interferes with its proper function, he removes it just as he would remove a thorn from a man's foot if he found that it interfered with his walking. But this does not prompt him to tell the profession of his success in curing people who are unable to walk, nor does he desire to be considered an orthopædic surgeon. No more should a physician who amputates a foreskin or releases an adherent clitoris and so destroys a source of peripheral and central annoyance, claim to be the discoverer and possessor of a new method in the treatment of epilepsy. In my opinion, the most dangerous specialist in the treatment of epilepsy to-day is he who claims to cure his patient by partial, complete, multiple or repeated tenotomies of the eye-muscles. Before going farther, I hasten to disclaim any prejudice either against the men who have made or are making such claims, or their methods, but it does not seem to me that a person who has examined into this matter carefully can be led to any other conclusion.

There is some slight evidence that patients afflicted with epilepsy are also the possessors of refractive anomalies more frequently than are their fellow-beings who are not epileptic, but the truth is that such ocular imperfections are but one of the somatic stigmata of degeneration and should be classified with the prehensile finger, the bullet-shaped head, the Darwinian tubercle, the Lamarckian hypophysis, the torus palatinus, and the many other defects which statistics prove beyond cavil are the natural possessions of the epileptic. I believe, further, that such muscular insufficiencies and refractive shortcomings should be corrected in epileptics the same as they should be in those who are not epileptics.

Theory of Epilepsy.—The theory that best explains attacks of epilepsy is the theory that postulates the existence of a histological neural entity; that is, the anatomical element or unit, the neuron with all its structural completeness, the cell, the neuraxon, the terminal arborization, and the terminal endings of the dendritic processes. Any

organic disease or any injurious condition which has not yet produced sufficient changes to be considered a disease, that interferes with the nutrition of this anatomical unit, and particularly of the terminal arborization of the dendritic processes, be they developmental, accidental, or degenerative, diminishes the functional ability of this part of the nervous system and thus causes a diminution in the potentiality of these structures, which is manifested intermittently by the liberation of energy, which liberation is sometimes termed an explosion of motorial force—or, in short, an epileptic attack.

This theory may be amplified and modified to explain the various clinical forms of epilepsy, be they motor, psychical, sensory, procursive, explosive, equivalent, petit mal or grand mal. And, on the other hand, without doing violence to the tenets of the theory, we may explain according to it the efficaciousness of the most useful plan of treatment—the only plan, in fact, that is of any considerable service in true epileptic neurosis, *i. e.* the bromide plan.

General Treatment of Epilepsy.

A consideration of the philosophy of the treatment of epilepsy is no inconsiderable aid to the proper application of medicinal agents, and to it I shall revert later.

The therapeusis of epilepsy varies according to the form of epilepsy. The plan of treatment that is applicable to primary, so-called idiopathic, congenital epilepsy is not the proper treatment for syphilitic, traumatic, accidental epilepsy; nor is treatment of either of these appropriate for the epilepsy which is dependent upon purely degenerative processes, such as parasyphilitic, post-cicatricial, etc., degenerations.

The treatment of epilepsy should be subdivided into the moral and hygienic treatment, which includes the diet, the discipline, the education of the patient, and all that these imply; and, secondly, into the medicinal treatment, which should include not only the drugs employed but the time of administration, mode of administration, *i. e.* the vehicle, the uniformity of the solution used, and the measures taken to offset disagreeable effects of treatment.

Experience has taught me, and I am sure it has taught others who have had a considerable experience with this disease, that the reason why physicians fail so often to effect such pronounced amelioration, not cure, of the disease as to satisfy patients and their families, is because they neglect almost entirely the moral and hygienic treatment and depend for their success—a fatuous ambition—on the administration of medicines alone. The result is failure. I am sure I echo the sentiments of many practitioners when I say that they dread the visits of an epileptic patient after they have had several trials at attempting to cure him.

Moral and Hygienic Treatment.—The *moral treatment*—by which I hope I shall not be understood as implying only the application of the canons of ethics, for I use the term in its widest sense—is particularly adapted to the primary congenital variety. This kind of epilepsy occurs most commonly at an age when the disciplinary measures are most efficacious. Habits of obedience, of the restraint of passions and appetites, of emotional equanimity, of temperate mental activity and industrious application should be instilled. The education of these unfortunate beings should not be neglected; on the contrary, it should be assiduously cultivated. The education should not alone be of the mind, but of the senses, and particularly of the hands. Many epileptics, if properly trained, become artisans, masters of handicraft, and laborers sufficiently skilful to earn a livelihood and frequently to compete with their non-handicapped fellow men. Modern methods for the education of backward children, teaching mainly by the aid of environment, are the best means to this end. Hand in hand with this must go the education of the body. If these children manifest any special predilection or ability for certain occupations, providing such do not involve excitement and strain, they should be fostered, while at the same time the bodily and mental life are cared for. Such details may seem pedantic, but the utter hopelessness of these cases, if they are allowed to go on without other and more intelligent surveillance than that of the ordinary parent, warrants them. The enthusiastic pedagogue and the intelligent physician must work together to make the best possible citizen out of the defective epileptic child. Institution-treatment, where all these forms of moral, mental, and physical development can be carried out, is a good one, in fact it is ideal. The necessity of beginning the education and treatment of an epileptic before the disease has continued for a certain length of time, before what may be conveniently called the "epileptic habit" has developed, is very essential.

The *hygienic treatment* of epilepsy is embraced in the regulation of the mode of life of these patients, their habits, indulgences, diet, exercise, movements, occupation, and the assumption and discharge of special functions and obligations. Climatic conditions do not seem to enter into the treatment of epilepsy.

The mode of life of an epileptic patient should be one that allows him to be free from care, untrammelled by any considerable responsibility, and one that is conducive to mental equanimity. The contraction of all habits, unless that of uniform occupation be considered a habit, must be deprecated. Tobacco, alcohol, and other unnecessary luxuries which may easily be made injurious are to be absolutely interdicted. Although it is impossible and frequently impolitic, for a physician to in any way interfere with the development of the normal

passions, such as love, engagements, etc., marriage for the congenital epileptic is to be severely frowned at. Any form of exercise that is not attended with great physical effort, or that will not jeopardize the patient's life or limb if an attack of epilepsy should occur while he is participating in it, is to be allowed and recommended. Of the sports, that of golf, perhaps, in which no other strife need enter than the prompting to outdo one's self, is the ideal one, although I have more than a few epileptics who engage in bicycling and other popular and pleasurable forms of exercise. It is a fact well known to every physician that unusual care must be taken to keep the physical condition of an epileptic up to that of an ordinary person who does not take any exercise or gymnastic drill for its maintenance.

What has been said of exercise applies also to amusements. There are very few amusements that an epileptic should be prevented from enjoying. Theatre-going in moderation, especially in the afternoon, social intercourse if the mental state of the patient allows it, parlor games, and the like, all contribute to vary the monotony of existence. The assumption and discharge of social functions by epileptic individuals will vary with each individual and will have to be decided by the physician according to the development of the patient.

In a word, it may be said that if a person who has epilepsy is capable of discharging social or political duties, none except that of marriage should be advised against, providing they do not interfere with the regularity and methodical arrangement of his life. The nature of the disease requires that for its treatment large quantities of a medicine which acts as a powerful depressant be taken for a long time. In order to overcome the peccant effects of this substance, Nature's best restorer, sleep, should be obtained in liberal amounts.

Diet in Epilepsy.—More important than all, perhaps, and very much more important than any one thing, is the question of diet. Like other functions of the body in epilepties, that of alimentation is frequently impaired, and this combined with defective inhibition and restraint of the appetite, frequently results in the most disastrous dietetic consequences. At one time it went abroad, and even met with acceptance in some quarters, that nitrogenous substances such as meat should not be consumed by people suffering from epilepsy, or, if so, then in the greatest moderation; and those who recommended such a plan were often able to fortify their claims by statistics which showed that the number of epileptic attacks in an individual who was not allowed to eat meat was considerably less than when he so gratified his appetite. The *post hoc propter hoc* of this argument is, however, a most fallacious one: cutting off the animal food very frequently gives the over-burdened digestive tract an opportunity to rest and causes a partial cessation of

the accumulation of the products of incomplete digestion which, on being absorbed into the system, exercise a pernicious effect upon the highest nerve-centres; and thus apparent benefit for a time seems to result from eliminating them from the dietary. Far greater benefit, however, is secured when the entire dietary is subjected to the physician's scrutiny. Epileptic patients should be given a mixed diet; neither the animal nor the vegetable products, nor the starches, nor the fats should predominate, nor should the one be taken to the exclusion of the others unless some special reason for such exclusion exists. Fermentable substances of diet, like starches and sugars, substances difficult of digestion and which, when digested, contribute but little to alimentation, tea, coffee, etc. are to be avoided. If all other treatment of epilepsy than that directed to the regulation of the alimentary canal and the maintenance of a normal digestion with a high state of nutrition were weighed, it is probable that more benefit then would follow than from the administration of the best medicinal anti-epileptic measures alone while dietetic errors were rampant.

Medicinal Treatment.

In speaking of the medicinal treatment of epilepsy I shall keep in mind a typical case of primary or congenital epilepsy, for this is the form in which medicinal treatment is attended with any sort of success. It is also the kind the treatment of which is most dependent upon medicine. As I have said before, I believe that the reason why so many cases of epilepsy under the care of the general practitioner are not very much benefited for all time by treatment is that although the prescribing of drugs may be unimpeachable, yet proper attention to the mode of administration, intelligent persistency, and careful attention to the details hereinbefore mentioned are not combined with such exhibition of medicine.

The Salts of Bromine.—*Their Utility.*—The one great measure in the treatment of epilepsy is the *salts of bromine*. If all other drugs which have a reputation as anti-epileptic remedies were lost to the profession, the results of treatment by this measure alone would be as good as they are to-day.

It does not seem to me that the selection of any particular salt of bromine is of such importance as to merit considerable discussion. By some, perhaps by the majority, bromide of potassium is considered the equal if not the superior of any of the other bromine salts. On the other hand, many prefer the bromide of sodium, not alone because it is more agreeable to take, but also because it is less apt to derange the stomach and because of its greater percentage of bromine. Bromide of strontium has been very successful in the hands of some practitioners. As a matter of fact, it is best to begin the treatment of

epilepsy with either the bromide of sodium or the bromide of potassium and, if these are not well tolerated or as efficacious as they should be, another salt of bromine or a combination should be tried. I have never been able to satisfy myself that a mixture of the bromides possesses any particular advantage over the individual salts, and, as Seguin has pointed out, the use of the single salt of bromide allows of the maintenance of a standard solution which can be used to great advantage.

Physiological and Toxic Effects of the Bromides.—In order to administer the bromide successfully, the physiological action and the toxic effects of the drug should be well in mind. It is not important, perhaps, to consider either of these here except incidentally. Such information can be obtained in any text-book on therapeutics. The common acute toxic manifestations of the drug are the eruption of acne, sometimes the production of very striking trophic changes going on to ulceration, bromine-inebriety characterized by vasomotor inhibition which may extend to very considerable vasomotor paresis with all its symptoms, such as cold extremities, clammy skin, slightly depressed bodily temperature and a lowering of the vital capacities; coated tongue; foul breath; loss of the palatal and pharyngeal reflex; stomachic catarrh; depression of sexual vigor; an unsteady gait, amyosthenia, particularly manifest in the legs; forgetfulness, slight degrees of aphasia, usually manifest by the misuse of words and terms, and ordinarily called paraphasia; slowness of mental response, inability to co-ordinate the complex of mental processes, and often a considerable degree of dementia. In acute bromine-poisoning the symptoms may develop so rapidly and be of such severity that they simulate intracranial trouble, such as brain tumor.

The severe manifestations of bromism can be counteracted by the administration of restoratives, cardiac and vasomotor tonics, by drugs that have a special beneficial influence upon the skin, and by the various hydrotherapeutic procedures with which every physician should be familiar. Very frequently a daily dosage of what would otherwise be toxic can by the utilization of these measures be administered without deleterious and disastrous results. The necessity for the continued use of the bromides to combat the frequency of epileptic attacks and also after the fits have ceased is conceded by every one. The intermittent administration of large quantities of bromides is to be deprecated. Nothing can be gained by interrupting the administration of the drug.

This medicine can be administered to best advantage if some definite solution of the salt, such as 25 or 50 per cent. watery solution, be used as a standard. It is impossible to say in grains what the dose of the bromide salt shall be. There is no more a "dosage" accord-

ing to weights and measures than there is of alcohol for a patient with typhoid fever. The dose is the amount the patient can dispose of. For one patient it may be a scruple, for another a drachm: it is necessary to make an individual study of each case. It is as ridiculous to say that the dose of bromide for an epileptic is a scruple four times a day as to say that the dose of morphine in peritonitis is one-fourth of a grain every four hours. No rational person would think of giving the latter directions, and no person who has had anything to do with the treatment of epilepsy would think of giving such instructions. The drugs must be given up to the point of tolerance, up to the completeness of its physiological action, and the patient kept on this if it controls the attacks; if not, toxic effects no severer than absolutely necessary must be produced, and at the same time measures must be taken to prevent toxic manifestations from becoming dominant. After the details have been arranged to the physician's satisfaction, he should study a chart made with the end in view of showing the frequency and time of the attacks; that is, whether they are matitudinal, nocturnal, or periodic, and whether they have any relationship to the occurrence of a periodic function, such as menstruation, whether they are of a petit mal or haut mal character, and whether they are preceded by an aura. If the attacks are always matutinal, the large dose of bromide should be given before the patient arises, and a similar plan should be pursued if the attacks are commonly nocturnal. In those cases in which there seems to be no definite time for the occurrence of the attacks and in patients who are occupied during the day, it has become a kind of custom with me to administer a small dose of bromide in the morning, another during the afternoon, and a comparatively large dose at night. This plan has the advantage that it facilitates sleep, while not producing sufficient stupor to interfere with the patient's waking-time. If, even with this plan of administration of the bromides, satisfactory results do not follow, they should be withdrawn and some other anti-epileptic remedy substituted. I desire to repeat that the desultory and irrational administration of this medicament is worse than no bromide at all. Natural states such as pregnancy are not at all affected by the administration of bromine, nor is the fœtus; and during such states especial care should be taken to prevent the occurrence of attacks.

Seguin has pointed out the advantage to be obtained if the salt is given well diluted and in some alkaline water such as Vichy, and for poor patients water made slightly alkaline by the addition of bicarbonate of sodium. The more liberally the dose of bromide is diluted the better will be its effect.

Abuse of Bromide.—In this connection one word may profitably be devoted to the abuse of bromide. I know of no other drug—with the

exception of those that produce habits, such as morphine and cocaine —that is so enormously outraged as the salts of bromine are. If the truth be told, their therapeutic application is very limited, and the disease under consideration is the only one that justifies their continuous, persistent administration in large doses. The plan which is so frequently pursued of prescribing bromide as a sort of pick-me-up merits the same condemnatory language as that used by temperance advocates against the prescribing of alcohol. It is only necessary to see the colossal mental and physical depravity that sometimes results from the ignorant administration of this drug in minor ailments, and sometimes even in epilepsy, to fully appreciate the truth of this statement.

The most important measure to overcome the severe acne which often attends the administration of the bromides, aside from the maintenance and improvement of nutrition, is some preparation of arsenic, preferably arsenate of sodium; unlike Fowler's solution, this solution rarely deranges the digestion. It should be given in moderately large doses and continued for a short time, one or two weeks, and then intermitted.

If the symptoms of *chronic bromism* become dominant, the patient being pale, with dry, crisp-looking mucous membranes; and is stuporous; forgetful, slow of breath and of heart; depressed; suicidal and emaciated, I have found opium a better stimulant than any other. It would seem to prevent the neural protoplasm from wearing itself out in futile endeavors to overcome the rapid waste of the body and to stay the latter till rest and nutrition can pick them up.

The best all-round vasomotor tonic, stomachic, and general restorative is nux vomica or its alkaloid strychnine, which is generally administered combined with dilute hydrochloric acid. When the toxic effects of the bromide are manifest by inhibition of sexual vigor and of the vesical sphincter, belladonna is often of considerable service to obviate these conditions. Belladonna has in its favor that it of itself is considered no mean anti-epileptic. The most potent aid in the hand of the physician to prevent bromism and its terrible consequences is hydrotherapy. A patient who loses weight and becomes anæmic, has depressed mental and physical vitality, is often started in the opposite direction if instructed to take a tepid or slightly cold plunge-bath in the morning, followed by a vigorous towelling or a spray-bath and blanket pack.

If it is possible, these patients should now and then take a course of treatment in some hydriatric institute, which are now found in nearly every city of any considerable size. They may be substituted, however, to no mean advantage, by the ordinary hose-pipe if sufficient pressure can be obtained, and by the bath-tub and sponge.

Caution should be used in prescribing the cold plunge or cold shower for these patients. Impaired vitality due to the administration of the bromide often prevents them from properly reacting. If for any reason it becomes advisable to materially diminish the dose of bromide which the physician has determined is sufficient to hold the attacks of epilepsy in abeyance, I consider that the plan which is safest above all others is that of putting the patient to bed and keeping him there until the usual dose of bromide can be administered;—so far superior to all others that I urge its employment in every instance where it is possible.

The most important adjuvant to the use of bromides, in the writer's opinion, is opium. The value of opium in some cases of epilepsy has long been common knowledge, but it was reserved for Flechsig to point out, as he did a few years ago, that opium administered for a short time in enormous doses, then stopped and followed by large doses of bromides, seemed to possess special value. I have given this plan of treatment an extended trial and am an advocate of its application in certain cases. In an article published on this subject about three years ago, I stated it was my opinion that in cases of idiopathic epilepsy which had become very chronic and in cases occurring in early life associated with such somatic and mental shortcomings that defect of the brain was indicated, this mode of treatment had special efficacy. Further experience with it has confirmed my belief. The plan is to administer ordinary pulveris opii or its equivalent of the extract up to 8 or 10 grains daily, the maximum quantity being reached as soon after the beginning of the administration as possible. The patient is kept on this maximum dose for six weeks; at the end of that time the opium is stopped abruptly and bromide of potassium or sodium to the quantity of 2 drachms daily is given. After a few weeks, varying according to the evidences of bromism produced, the quantity is reduced one-half, and later this can be diminished to 30 or 40 grains, and in some cases even less than this, in twenty-four hours. In my experience the attacks of epilepsy can be materially reduced in this way in almost every case that has shown itself obstinate to the ordinary bromide plan. After a year or two, if the attacks are not cured or kept in abeyance, the opium may be repeated. I have yet to see any detrimental results or sequences of employing this method.

The combination of equal parts of chloral and bromide, which is advocated by Seguin in certain cases, has been put to the test of some personal experience. Its field of usefulness, I believe, is more limited than that of the opium-bromide plan.

Of the other drugs that have been persistently advocated in the treatment of epilepsy by clinicians whose names are synonymous

with integrity, borax and belladonna, and perhaps adonis vernalis, are the most important.

Personally I have had considerable experience with the use of borax in epilepsy, but I have never been able to convince myself that it had any effect upon the disease at all comparable to the bromides. In cases where for some reason the latter cannot be administered it is the best substitute. It should be given in powder or solution, in from 10 to 30 grains three times a day. The only bad effect of such administration is an occasional attack of psoriasis which is easily combated by the administration of arsenic. Belladonna and digitalis and more recently adonis vernalis have been recommended in epilepsy, either alone or in combination with the bromides. One is never justified in administering them alone, at least not with the hope of effecting a cure; very frequently, however, they become important aids, not alone to offset some of the disagreeable accompaniments of bromide administration, but to pick up cardio-vascular tone and aid the system in carrying off the bromides. The tincture of these drugs is generally used, the first two in doses of from 5 to 10 drops and double this quantity of the latter. They may be administered with the bromides. With the exception of borax, perhaps, none of them deserve the name of substitutes for bromide.

A number of other substances—such as simulo, antipyrin, acetanilide, nitro-glycerin, nitrite of amyl, and anti-rabic injection—have been undeservedly praised and hailed as cures for epilepsy. Each of these, with the exception of the first named and the last, has a place in the therapeutics of epilepsy, but only to fulfil some certain definite mission, and to be used symptomatically. For instance, in cases where a distinct vasomotor manifestation precedes an attack in the shape of an aura the administration of nitro-glycerin with the bromides seems to have a particularly beneficial effect, and especially in petit mal attacks.

Measures that have been extensively written of and which I believe are not of the slightest value are hypnotism, hydrastinine, salicylates, duboisine, picrotoxin, cannabis indica, amylene hydrate, osmic acid, sclerotinic acid, and cocculus indicus. It may be difficult to believe that any of these substances has been praised as efficacious, but a review of medical periodicals shows such to be the distressing truth. None of them deserves a trial.

After briefly referring to the various substances that are used in the treatment of epilepsy it is seen that the one substance to which we attach faith is some salt of bromine. The others that have been mentioned with favor are aids to the bromides or substances that can be made use of when the administration of the former is denied.

Moral Suasion in the Treatment of Epilepsy.—Occasionally we meet with patients who are not willing without considerable persuasion, and sometimes even not then, to undergo the bromide plan of treatment, which often involves a considerable suffering and deprivation. To overcome their objection it has only to be shown to them and their parents in a convincing manner that they are afflicted with a disease which without treatment is progressive, and that to a most ignominious end, the pauper or insane asylum, or to the custody of a care-taker if their worldly circumstances allow. If the hope can be extended to them, as the writer believes it can be, that the plan of treatment which is advocated, although it does not often completely cure the disease, very often so far restores the patient to health and freedom from attacks that he is able to discharge the duties of a good social and political citizen, the attending bromism, the mental deviations, and the other symptoms which the long-continued administration of the salts of bromine sometimes produce are nothing comparable to the misery which the possession of a progressive epilepsy entails.

It has often been remarked that new plans of treatment and change of doctors are as beneficial to epileptic patients as change of air and clime are to other invalids. There is truth in this remark, but it is not difficult of explanation. The new physician inquires more closely into the diet, gives more stringent directions as to mode of life, etc., and starts the administration of medicines on a definite plan and the results are better for a time than his predecessor was able to get. But a sort of a personal inventory on the part of the first physician and a review of the details of the administration of the bromides would have secured equally good results. It is this persistent attention to minor points, regularity of eating, bathing, administration of medicine, and all that hospitalization implies, that makes the result of institution treatment better than that of private practice.

Treatment of the Attack.

For the greater number of cases this can be summarized in a line: Place the patient in such a position that he cannot injure himself or destroy anything about him, and await the natural cessation of the attack. It is necessary usually to place something, such as a piece of cork, rubber, or the folded ends of a handkerchief between the teeth to spare the tongue from being bitten when the tonic spasm of the jaw muscles forces the jaws together. If the patient is bound about with clothing in any manner it should be loosened so that respiration and cardiac action may be in no way impeded. It should be borne in mind that attacks are liable to occur at night and that sometimes such patients suffocate themselves, the result of crowding the face into the

pillow, and precautions must be taken to avoid such accidents. When the convulsive part of the attack is over, the patient should be given hot, concentrated liquid nourishment, and efforts should be made to prevent him from going at once into a stuporous sleep from which he awakens after a variable but prolonged time, feeling as though he had received severe corporal castigation and with a confused, exhausted feeling in the head. In some cases it becomes necessary to employ means to cut short the convulsive part of the attack, particularly when there is a tendency for the patient to go into a condition known as *status epilepticus*, where convulsive phenomena succeed one another with great rapidity and often without any intervening period of stupor. In the Hospital for Epileptics, where only the severer forms of epilepsy are kept and where status epilepticus as a clinical manifestation is often seen, I have had the best results from the employment of inhalations of chloroform, given alone or combined with a few inhalations of nitrite of amyl. This procedure is strongly recommended. Occasionally after prolonged *status epilepticus* or after a number of attacks occurring in rapid succession the patient will go into coma. The most useful measures in such a condition are drop-doses of croton oil, if constipation exists, followed by coffee for its stimulant effects, small doses of belladonna and the application of an ice-bag to the head.

Domestic measures, such as causing the patient to swallow a quantity of salt or salt water, a proceding that is often resorted to amongst the unenlightened, are to be frowned at. They cannot possibly do any good. Another procedure which can do no harm, but for the utilization of which time should not be wasted, is the immersion of the patient in hot water, most often employed in the case of young children. The plan of cutting short the attack already mentioned is the rational as well as the efficacious one.

In some cases of epilepsy in which the convulsive phenomena are preceded by a warning, and particularly in those that have a sensory aura passing toward the head from one of the extremities, the attack may be prevented or its severity modified by subjecting the part from which the warning sensation passes to a smart blow or sensory impression. Just how the stimulus works is a problem in the dynamics of physiological psychology that no one has attempted to explain. The warning given to patients is never far removed temporally from the oncoming convulsions, and therefore the sensory insult must be made by the patient. To aid him in doing this it was suggested by Hughlings Jackson that a girdle be worn beneath the sleeve above the wrist, this being the usual starting-point of these aurae, and as soon as the patient felt it coming on to give the girdle a powerful twist, or, if a loop, a tug at the free ends. It is really surprising how often this arrests the

attacks in patients who have this kind of warning, but alas! these are very few compared with the entire number of epileptics. Occasionally the arrest of attacks in this way only robs the epileptic phenomena of the convulsive part, and the vertigo, the stupor, the feeling of profound prostration following it are just as severe as after an ordinary attack. In such a case the patient has little to choose between.

It is not necessary to speak specifically of the treatment of the clinical forms of the epileptic neurosis, and I shall content myself by saying that the same general treatment is applicable in one form of the epileptic neurosis as in another. The treatment of the attack may vary somewhat. In epilepsy procursiva, for instance, and in some manifestations of the epileptic equivalent it is necessary, in order to prevent the patient from doing injury to himself and perhaps to others to restrain him, although he does not appear to be devoid of his faculties. Some sleep seizures usually reckoned as somnambulistic are often of an epileptic nature, and their occurrence calls for stringent measures taken to combat the neurosis. Likewise a considerable proportion of the cases of dual personality are explained by the fact that their one personality is a normal one, the other an epileptic one.

Traumatic and Accidental Epilepsy.

These forms of epilepsy do not necessarily mean that the true epileptic neurosis is present at all, although the *habitus epilepticus* may and does develop if the disease continues for any considerable length of time. The treatment of the traumatic and accidental epilepsies depends very largely upon the origin of the disease. If it be due to trauma that has set up changes of an irritative nature in the cortex of the brain or the tissues in juxtaposition to it, and if it can be localized, the proper and only treatment is to excise it at once. Experience of the last few years has taught that the skull-cavity can be entered, if done with great skill and care, without materially jeopardizing the patient's life. If the lesion that is the cause of the epileptic attacks be found, be it of the calvarium, the meninges, or the cortex, it should be completely excised. It needs to be borne in mind that the danger to the patient is not materially added to by the removal of a generous piece of the cortex in which the lesion is situated or on which it has made pressure. The reason why so many cases of Jacksonian epilepsy fail to be cured by operation is that the operation is not undertaken early enough. If the diagnosis can be made before any considerable amount of change goes on in the brain which forms the anatomical basis of epilepsy, be the lesion in the terminals of the dendritic processes the probable one or be it an increase of neuroglia substance, the chances of success from the operation are

good—much better than some writers are willing to concede. This statement holds true only when the operation is undertaken when the patient has as yet had only a few attacks.

I have under observation now a young man who was operated on two years ago, and a large portion of cortex, which showed striking changes of meningo-encephalitis, removed, who has been absolutely free from any sign of epilepsy ever since immediately after the operation. It is too early to report his case cured, but it seems to me well on toward that end. The diagnosis in this case was made after the second convulsive attack.

The practical point to be remembered about these cases, in addition to what has been said is, that even though the operation has ameliorated or apparently cured the disease, the patient should be kept on moderate doses of bromides for from two to three years after the last fit. When the duration of the case and the character of the attacks puts it beyond the pale of operation, treatment is in nowise dissimilar to that of congenital epilepsy.

The fact needs no mention that the treatment of epilepsy which is symptomatic of new growths, pressure, or any localized lesion, is to remove it and thus get rid of the source of irritation, even if only amelioration is gained by such treatment.

True syphilitic epilepsy—that is the epilepsy of luetic meningo-encephalitis, gummatous infiltration of the meninges, localized syphilitic disease of the blood-vessels and localized cortical gummata—a disease which naturally occurs only after adult age has been reached, and then not so often in the opinion of the writer as some American and foreign authors would have us believe, requires rational and vigorous anti-syphilitic treatment. It is not sufficient to give the mercury alone, that powerful absorbent of newly formed granular tissue, iodide of potassium, must be given also, in very large doses and freely diluted with water. In the administration of mercury the writer has a personal preference for its use by inunctions. If inunctions are properly done it would seem that the patient can be brought more quickly under the curative influence of the drug than in any other way.

Genuine syphilitic epilepsy often assumes the clinical form of Jacksonian epilepsy, and this is a form of symptomatic epilepsy that should not be subjected to operation for the removal of the *materies morbi*, at least not until anti-syphilitic treatment has been tried and found lacking.

The scar-like tissue that is sometimes left after the absorption of granular masses constituting syphiloma by vigorous anti-syphilitic treatment sometimes keeps up symptomatic epilepsy after the real growth has disappeared under medication. There is no reason, if

the surgeon will undertake it, why these scars should not be excised, and if on opening the skull he finds remains of the syphilitic new formation which the anti-luetic treatment has not been able to cope with, they, too, should be removed.

Anterior syphilis produces epilepsy sometimes not by the presence of syphilitic new growths in the meninges and cortex, but by setting up in these parts a degeneration which is now usually called para-syphilitic, and which is comparable to the lesions of tabes and general paresis—syphilitic in origin, but not syphilitic, or at least not characteristically so, in nature. The treatment of this form of epilepsy with anti-syphilitic measures is useless, if not worse than useless. If it be granted that after death these cases do not reveal lesions that can in any way be considered syphilitic it is hard to suggest a reason why they should be subject to anti-syphilitic treatment. The treatment that these cases require, and the one that is most serviceable, is the combined tonic and bromide plan, the nutrition of the patient being kept up to the highest possible point all the time. These cases do not tolerate anything like the quantities of bromide that a case of congenital epilepsy does and it is necessary to be on the careful look-out for toxic symptoms of this drug, for it is in these that sad results from careless administration of bromide is often seen. The general dietetic, hygienic, disciplinary treatment of this form of epilepsy does not differ from that of the form first considered.

I believe that I have already said sufficient in answer to the question, What can we expect from the surgical treatment of epilepsy? in the remarks on the treatment of traumatic epilepsy. But let me summarize the matter in a few words:

The present generation of physicians has witnessed the most remarkable advances of surgery that have ever been made. This may in a way account for the furor for operating on all sorts and conditions of epilepsy that seemed to take hold of surgeons the civilized world over a few years ago. If it does not, we are unable to suggest the answer. That such a furor existed no one who examines the literature can doubt. The result of this experience would seem to be that, to-day, operation on the skull, trepanation of the skull, incision of the membranes and the removal of cortex, is only justifiable under the conditions already mentioned. Absolutely nothing is to be gained by subjecting any other types of epilepsy to operation.

It has often been noticed that in almost every case after operation there is a temporary cessation, of greater or less duration, of fits. This has been attributed to the effects of the operation *per se*, and it has been pointed out that a corresponding respite follows any operation, it matters not on what part of the body it is made. I am inclined to believe that the operation *per se* has very little to do with

diminution of frequency of the fits, but that it is due to hospitalization, limited, selected diet, careful nursing, the discipline of regularity, increased amount of sleep, etc.

The treatment of epilepsy that develops for the first time in later life, epilepsia tardia, is a different matter from the treatment of primary idiopathic epilepsy. In the majority of cases this form of epilepsy is an expression of some diathetic condition anterior to the epileptic attacks, and it is necessary to continually combat this while treatment is being directed to the symptom epilepsy alone. The real anti-epileptic agent in these cases as in the others is bromide. Its beneficial effects are often materially increased if combined with nitro-glycerin.

The general treatment of these cases differs in a way from that suggested for the parasyphilitic variety. The danger of the *status epilepticus* is particularly great, and there should be no hesitation in attempting to cut it short with chloroform and nitrite-of-amyl inhalations.

The treatment of parents, guardians, and care-takers of epileptic patients is oftentimes quite as important a feature as the treatment of the patient himself. The necessity of deputizing the entire administration of medicine, as well as scrutiny of the diet, to some intelligent person who has the interest of the patient at heart is very urgent. It is wise to impress upon parents from the beginning of treatment the nature and probable outcome of the disease and the necessity for treatment as detailed and careful as that for typhoid fever. To carry it out without becoming discouraged, especially when in the beginning no great progress is made with the disease, is often very trying, and such parents require diplomatic handling more for the sake of the patient than themselves. All in all, the institution plan of treatment for epileptics from the lower walks of life is best. For those whose providential position allows them to carry out the pedagogic, disciplinary, and therapeutic plan above detailed, this method offers all that science can offer for this unfortunate class, and it must be said it offers more than one usually infers from reading text-books on the subject. The treatment of epilepsy in reality is not the cultivation of a barren acre. Personally, I know of no organic disease of the nervous system of comparable chronicity and severity in which the results of treatment, intelligently carried out, are better.

HYSTERIA.

The treatment of hysteria requires more tact, perseverance, and industry than any disease in the domain of neurology. I shall consider the subject under three headings: 1. The prophylactic treatment;

2. Treatment of the neurosis (or psychosis, more properly called);
3. Treatment of an attack, and of individual manifestations.

The nature and genesis of hysteria cannot be discussed to any extent here. It seems to be universally conceded that hysteria is a nervous disease, using the term in that broad sense to include all of the psychoses in which a dynamic perversion of neural energy constitutes the basis of the innumerable symptoms. The ancient conception of the disease made it an attribute of the reproductive organs and restricted its occurrence to the female; a more modern one looked upon it as a shortcoming, and reckoned it in the category of conceit, affectation, and other attributes of puerility and of defective evolution; but the most modern view, the one that we have mentioned, associates its genesis with distinct neuropathic heritage as a predisposing cause, and psychical trauma, and all things contributing to it, as its most important exciting factor.

Hysteria, in other than its minor forms, which are not infrequently seen manifest in literature, art, and politics as well as in the consulting-room, is relatively uncommon in this country. In the Latin countries and their territorial environment, such as Austria and Switzerland, it is a very common disease.

Like all degenerative neuroses and psychoses, its treatment should be begun before the birth of the child who is heir to it. It cannot be too strongly urged upon physicians who have the care of families that the direction of an hysterical woman's pregnancy should be with the end in view to bring forth a child with a stable nervous organization, as well as a successful accouchement. This can in a measure be contributed to by studiously arranging her environment so that everything that contributes to mental equanimity and self-restraint is in evidence. All things conducive to the opposite are to be avoided.

The children of hysterical mothers should be removed from the tutelage and espionage of the latter as soon after the actual formative stage of the child's real character, from the sixth to the tenth year, as possible. Such a plan contributes not alone to the welfare of one, but is beneficial to both.

The education of children of hysterical parentage calls for nearly the same amount of intelligent collusion between the physician and the pedagogue as does that of defective children. The details of such treatment must suggest themselves to every intelligent family physician. All manifestations of precociousness are to be discouraged, childish coquetry and self-indulgence is to be exterminated, and the epochal period of menstruation and maturity is to be jealously guarded. The trend of modern civilization in this country, happily, is toward the development of the body, the cultivation of out-door

sports and plenty of refreshing sleep for children; these are inimical to the development of hysteria. Inculcation of the precepts of self-control, generous feeling, altruistic sentiments, and intolerance of mawkish sympathy does much to prevent hysterical tendencies. The psychical trauma which starts the dynamic defects of hysteria into existence are often traced to terrorizing tales of the nursery, to sentimental *affaires de cœur* which the *fin de siècle* girl is often permitted to take seriously, to the assumption of marital obligations by persons totally unfit, and to abnormal indulgences such as *coitus reservatus*, etc.

The general treatment of the profound neurosis hysteria is not easily disposed of in a few paragraphs, so varied are the physical, social, and mental conditions which have to be contended with. Very often the measures to overcome the collective manifestations that constitute the state hysteria must be applied hand in hand with those taken for the relief of some particular symptom, such as contracture, paralysis, or blunting and obscuration of some special sense; so although I shall have to speak of these measures separately the truth of this statement should be borne in mind.

The first most important step in the treatment of an hysterical patient is for the physician to put himself entirely *en rapport* with the patient and family of the patient—that is, secure the confidence of the former and the co-operation of the latter. In the severer forms of the disease, a most important disciplinary and hygienic measure is complete or relative isolation, a plan which all concerned are apt to look upon as an unnecessary cruelty directed against one who has been able to exist only because of the tender care and continous sympathy that has been lavished upon him or her. Even in the milder forms of hysteria, and by this we mean any hysterical manifestation short of *grand hystéric* and the clinical conditions unfortunately called hystero-epilepsy and hystero-catalepsy, it often becomes absolutely necessary to separate the patient from her previous social and family environment, not only to overcome the comparatively mild manifestations of the disease, but to prevent it from getting a firm claim upon the patient. In many cases uncontrollable exigencies will necessitate that partial isolation be carried out in the patient's home or in a hospital, but whenever feasible it is best accomplished away from home in a sanatorium or house directly under the physician's medical supervision, and in every instance it should at least be so complete that the patient comes in contact only with strangers.

Anything that tends to lower the patient's nutrition and vitality is conducive to hysterical manifestations. These accidents are to be guarded against, and when they occur they must be amended as soon and as thoroughly as possible. The helpful measures to attain this

end, aside from regulation of the digestive organs and scrutiny of the diet, are hydriatric procedures, massage, exercise, and electricity. When whole volumes are devoted to hydrotherapeutics it is easily seen how difficult it is to convey a just appreciation of its merits in a few lines. In a general way, however, it may be said that for all hysterical phenomena, with the exception of spasms, cold water, in the shape of douches, sprays, plunge, wet pack and drip-sheet, is the serviceable form. Its use is intended to serve two purposes: tonic and sedative. The tonic effects are obtained principally by the use of the douche, the one essential physical element of which is pressure, directed particularly to the spine and to the solar plexus; by the plunge, which gives a profound shock and is followed by a reaction and beneficial metabolic changes; and by the spray or needle bath, the beneficial effects of which are on the peripheral nerves, vasomotor, sensory, and motor. For the many details of the practical applications of hydrotherapy the reader is referred to special works on that subject. I do not mean to convey the impression that in order to get all the benefit to be had from these procedures it is necessary to have any elaborate apparatus. All that is really needed is a tub, a piece of hose-pipe with a detachable spray, if the requisite pressure can be obtained, and a pitcher. If it is decided after trial and careful consideration of the patient's tolerance, *i. e.* the reaction and after-effects, that the most beneficial impress can be made upon the *morale* and nutrition by means of the douche, its application will have to be guided largely by individual idiosyncrasies of the patient. In some instances reaction will be accompanied by frontal headache and excessive lassitude, cold extremities, etc. In such cases these can usually be avoided by having the patient's head enclosed in a towel rung out of iced water, and by having the douche of from 50° to 70° F. applied for one to three minutes' duration while the patient stands in warm water. Cold water can often be utilized to great advantage by the use of drip sheet, particularly if the patient is sleepless, applied just before retiring.

When the spray or needle bath is used it should be borne in mind that this is one of the most potent ways of dissipating bodily heat, and the precaution taken of applying it for not more than a few seconds and of seeing that becoming reaction follows its application. The cold plunge-bath, when the patient's circulation will allow of its use, is one of the best general tonics, particularly if the patient remains in the water for only a few moments, and during that time active friction is kept up either by an attendant or the patient himself, and after the bath vigorous towelling or percussion. If the plunge is too great a shock, patients can often be educated to it by beginning with a temperature of 80° to 90° F. and each day making

it five degrees less, until finally it can be taken at the temperature of the room—that is, of a bath that has been drawn for considerable time.

The technique of hydrotherapy is best gained by experience, and whenever feasible the physician should avail himself of a properly equipped hydriatric institution. Its application will be most satisfactory, however, when the physician gives personal supervision.

The form of electricity that is most useful in combating the asthenic state of an hysterical patient is also often best decided after trial. Usually it is either faradic or static electricity. The latter is often frowned at nowadays, as it plays such a conspicuous part in the armamentarium of the charlatan, but it must be admitted that it frequently has not alone a commendable moral effect but acts as a powerful tonic to the muscular and nervous systems as well. In fact its action is not unlike that of another therapeutic procedure which has come much into vogue in our day, rapidly repeated and multiple percussion advocated by Granville. This form of electric energy has the same characteristics as faradic, viz. high tension and slight quantity, and often has quite as good effects in hysteria. It is not so applicable to erethitic and painful states as is faradic electricity of the long coil and rapid vibration.

I am not able to speak of the efficaciousness of the electric bath and electric douche from the standpoint of any considerable experience, but what I have seen of these procedures abroad has not greatly prejudiced me in their favor.

In some instances where hyperæsthesia or anæsthesia are not being specifically combated and where electricity is applied for its general tonic effects, general faradization is one of the most satisfactory ways of using this agent. Massage, Swedish movements, calisthenics, and various forms of parlor gymnastics are often efficaciously employed to combat certain manifestations of asthenia and to increase muscular tone while the patient is undergoing house-treatment. The various forms of exercise such as golfing, bicycling, climbing, and the like—which are so often serviceable not only to improve the patients' general condition but to teach them self-reliance and make them less indulgent and introspective—all may be made to play a very important part to prevent hysterical paroxysms or to assist in recovering from them. Although the life of an hysterical patient should be one of physical activity, in some cases it is necessary in the beginning to follow a plan of treatment known as the rest cure, as proposed and carried to such a point of efficacy by Mitchell, or a modification of it. I hesitate, however, to use the label "rest cure," for it has been my experience that a rest cure labelled and carried out in the perfunctory way in which a series of massage movements are carried

out—that is, without the greatest circumspection and variation of detail for every patient—is about as hazardous a formulated draft of rules as can be put into the hands of an inexperienced and injudicious physician. I have therefore thought it wiser to discuss the various details and allow the reader to label them as he likes.

The regulation of the various functions of the body, such as that of the bowels, the kidneys, the reproductive organs, etc., I do not understand to require explicit directions here, more than to say that careful consideration of them will be rewarded in this disease, as it is in all others where there is a dissociation of the production and expenditure of energy. Restoratives such as iron and cod-liver oil, appetizers such as the simple bitters, and occasionally sedatives, particularly those acting on the sympathetic nervous system, all have an important place in the therapy of hysteria.

Treatment of Individual and Associate Manifestations of Hysteria.

The most common individual and associate manifestations of hysteria are hysterical paroxysms or convulsions (which may vary from slight perversion of emotional display up to the most violent and alarming state of clonic and tonic convulsions associated with the most repulsive and gruesome distortions and condition of spasm the continuance of which is inimical to life); contractures; paralyses; blindness; deafness; trophic troubles such as œdema and atrophy; anorexia; vomiting; mutism; pseudo-angina; colic; clavus and rachialgia, and so on almost to the end of all the diseases that are accompanied by suffering, deformity, or outward manifestation.

It is with the treatment of the spasmodic and convulsive phenomena that we are particularly concerned, although we cannot consider these without referring to other accompaniments, for many of them (known as "stigmata") are the constant and pathognomonic attendants of hysteria.

In the treatment of the spasmodic accompaniments of hysteria the first point that I wish to impress is that there is rarely any need of great haste. I say this on account of the fact that the most common proceeding for the physician when called to a patient in the apparently agonizing condition of a hysterical paroxysm is to conciliate the family by cutting it short with a hypodermic injection of morphine—as baneful and ill-advised an action as can be easily imagined, and one that should scarcely if ever be resorted to. The first thing to be done is to dispense with the aid of sympathizers, busybodies, and other unnecessary elements of the gathering which is sure to be about the patient. The physician owes it to himself to assure the family that he stands between the patient and danger and that although the attack

may last for some time the eventual outcome will be satisfactory. The patient should be placed so that she cannot hurt herself or do violence to things or persons about her, and, if there be any necessity, no hesitation should be had in the use of artificial measures of restraint such as the "captive" sheet or a strait-jacket. If there be any danger of asphyxiation the patient should be given a few whiffs of chloroform, and this measure is always to be preferred to morphine. Sometimes by aid of this the patient can be transferred from an hysterical, convulsed condition, particularly when aided by suggestion, into one of quiet somnambulism. And in all cases when the condition of the patient will allow of it an endeavor should be made to quiet and assure the patient by suggestion and so carry her into a somnambulistic condition. Very often when the patients are in a state of apparent or complete unconsciousness they can be sufficiently aroused by pressing on hysterogenetic zones to allow them to become amenable to suggestion. In some cases, and particularly in those in which the physician has reason to believe that severity of symptoms is being in part simulated, putting the patient abruptly into a cold bath has the most salutary results. The value of prolonged warm baths in hysterical convulsions, as in all other convulsive conditions, has been greatly overestimated, and resort to it generally represents time wasted. The administration of foul-smelling, pungent medicines such as the valerianate of zinc, tincture of valerian, asafetida, etc., is the legacy of a barbarous pharmacology; they are of very slight service.

I have sometimes thought that a capsule containing valerian and compound spirits of ether had some influence in warding off an attack if the patient took it when she believed she had premonitions of an attack, but I am willing to believe that it acts, not by virtue of the drugs, but by suggestion. I have, however, seen a dose of apomorphine clear up a hysterical paroxysm with great celerity.

There are very few if any cases that do not submit to the procedures that we have mentioned. The treatment after an attack is that already detailed directed against the general neurosis.

Here it is fitting to say a word anent the surgical procedures, particularly on the generative organs, that have been proposed for hysteria. They are particularly the removal of normal ovaries (oöphorectomy so-called), hysterectomy, clitoridectomy, and castration in the male. I do not mention operation on the coccyx, on the vagina, etc., because these are of comparative insignificance when compared with the others. It should be repeated that no one can be more solicitous that all parts of the body should be carefully examined and restored to conditions of normal functioning than the writer, and if it requires a galaxy of specialists or a general practitioner to do this,

their services should be enlisted, so that the object may be attained. After saying this, however, I deem it fitting to say that the same punishment should be meted out to the man who wilfully removes a normal uterus, ovary, or testicle, or one not so far diseased that it cannot be nursed back to a normal condition, as is judicially given to him who premeditatedly takes deliberate aim and maims with weapon of any sort a fellow creature. In the light of a comprehensive knowledge of the reports of "cases of hysteria and hystero-epilepsy cured by surgical procedure upon the generative organs," I say that I refuse to believe that one example of the neurosis hysteria has ever been cured by such barbarous, unscientific, unrighteous measures.

The place which hypnotism holds in the therapy of hysteria has always been and will probably always remain a very insignificant one, using the term hypnotism in the only sense in which the majority of the profession, in common with the laity, will use it, viz. that of carrying a person into some degree of unconsciousness by means of impressions made on some one or all of the special senses. I believe that suggestion, whether by word of mouth, by precept, or by ocular demonstration, may often be used most beneficently, and if these be reckoned hypnotic procedures they have a legitimate place in the therapy of this neurosis. But to abuse them, or to surround them with any air of mysticism, or to flaunt them as an unusual, or individual, possession is to place one's self on the same plane with the charlatan or the negro hoodoo. It is far better to avoid the use of hypnotism entirely as a definite procedure than to abuse it by borrowing the airs of a professional hypnotist.

The treatment of the various stigmata of hysteria is the treatment of the neurosis itself; only a few of them deserve special mention. The proceeding known as metallo-therapy may have some slight efficacy in dissipating hysterical anæsthesia, and may be made use of to the extent of laying on pieces of magnetized iron or simple strips of copper, but to speak of their beneficial effects when administered internally is to confess an entire ignorance of the rationale of their occasional effectiveness. Hysterical anorexia is often a most obstinate symptom to overcome, and all the paraphernalia of general and local treatment must be brought to bear on it. Forced feeding should be left to the last.

Hysterical contractures are usually amenable to massage and faradic electricity. The application of the latter by means of the faradic brush is often most efficacious in overcoming anæsthesia. Occasionally to overcome the contractures the aid of complete etherization or chloroformization must often be espoused, and the co-operation of the orthopædic surgeon, with his splints and braces, enlisted.

OCCUPATION SPASMS AND CRAMPS.

A SPASMODIC or cramp-like condition in individual muscles or groups of muscles that act together in the performance of certain acts of co-ordination such as writing, telegraphing, piano-playing, and similar occupations, and which completely incapacitates the possessor from further indulgence in such occupation, is a condition which the physician is frequently called upon to treat, and one which often taxes his skill, patience, and ingenuity. The number of these occupation "cramps" becomes greater every year in proportion as human inventiveness devises new sports or labor requiring complex co-ordinated muscular activities.

The most common of these affections at the present time are those just mentioned, to which may be added similar conditions occurring in milkers, golfers, cigarette-rollers, smiths, ballet-dancers, etc.

Writer's cramp (graphospasm, or mogigraphia) is the most frequent of these, or at least has been until latterly, when the extensive use of the typewriter is replacing the scrivener. It is the most obstinate to overcome, and it may be taken as a type of this class of disorder.

For a long time occupation-cramps were considered to be an expression of fatigue and exhaustion of peripheral parts, of the structures in which the spasm is manifest. This view is held by none except venders of apparatus to cure writer's cramp at the present day, and the symptoms are looked upon as an expression of a constitutional neurosis called into activity by some persistent and fatiguing labor. Such a neurosis has no individual anatomical seat, except the collective motor and sensory neurons be so considered. Its occurrence in neuropathic individuals and in those who manifest some evidence of nervous instability, such as neurasthenia, migraine, tic, neuralgia, or even organic nervous disease, is evidence that the condition is a constitutional one with a local place of display which occurs under the auspices of exhaustion. The treatment of the occupation-spasms can only be successful when this conception of their genesis is heeded and the plan of treatment based upon it. The local treatment of such a condition as writer's or telegrapher's cramp alone is never sufficient, no more than the local treatment alone of profound neurasthenia associated with enlarged prostate in a young man addicted to sexual excesses and irregularities would be considered sufficient.

The most essential feature in the treatment of these affections is cessation of the occupation which is the cause of its occurrence. Much may be done to prevent writer's cramp by the intelligent observation and care of teachers in correcting faulty methods of holding pen and pencil while the child is learning to write. More rapid and satisfactory progress is made with these cases if insistence on this is

required from the start. Very frequently the relinquishing of occupation means cessation of one's livelihood, but it is far better to do this at a time when the patient has the capacity to turn to something else than to consume time which may be made valuable to him by treatment in the utilization of such makeshifts as writing with the left hand, employment of apparatus for writer's cramp, etc. Naturally, if the physician is consulted early he may counsel the use of large penholders or some apparatus, such as Nussbaum's bracelet, or that of Wolfe or of Anderson, that prevents the muscles from getting into such a state of contraction that cramp occurs, the use of the typewriter, etc.; and if at the same time active measures can be taken in the way of hydrotherapy, exercise, massage, electricity, tonics for the restoration of the general health, it may not be necessary to completely give over his occupation. Time will be saved, however, in every instance by so doing. When the patient has ceased or materially modified the occupation that causes the spasm he should be put through a restorative plan of treatment not unlike that employed for other neuroses, such as neurasthenia and hysteria, the object being to improve the nutrition, increase the bodily weight, secure refreshing sleep, develop muscular strength, and restore the equilibrium between production and expenditure of nervous energy.

Treatment directed toward the relief of the spasm should consist in enveloping the hand and forearm in a wet, cold pack once or twice a day, the use of a mild galvanic current directed through the brachial plexus, the positive pole over the latter, the negative at the back of the neck, for fifteen to twenty minutes each day, the administration of sedatives such as hyoscyamus, belladonna, chloral, and the valerianates, and by the hypodermic use of strychnine in large doses, $\frac{1}{30}$ to $\frac{1}{15}$ of a grain once or twice a day directly into the tissues where the spasm is manifest. This last measure is usually not required, but when the others fail to secure the desired benefit there should be no hesitation in using it.

Coincidently with the utilization of measures taken to better the general nutrition, local gymnastics, massage, etc., should be employed to strengthen the parts which are, or were, the seat of the cramp. For this purpose massages and resistant exercises of the individual fingers and muscles of the hand and forearm should be practised most persistently. These measures are by far the most important in conjunction with the general treatment, in restoring the patient to health.

A return to the occupation which excited the spasm should be delayed as long as possible, and at the slightest indication of a return of the condition it should at once be relinquished. The treatment of the various other forms of occupation-spasms differs in no wise

from that already detailed except as influenced by the parts of the body in which they occur.

There are a number of spasmodic conditions, some of them analogous to the spasmodic ties on the one hand and the occupation neuroses on the other. They are masticatory spasm, nodding spasm or spasmus nutans, spasm of the tongue or aphthongia. Other spasmodic conditions, such as phantom tumor, rectal spasm, œsophageal spasm, etc., are purely hysterical. Spasmodic wry neck and facial spasm are considered as tic of the nuchal and facial muscles respectively.

The treatment of some of these conditions requires individual mention, such as spasmus nutans of infants, a condition which occurs very largely in rachitic children. The movements usually disappear after the patient is given thorough treatment with iron, preferably the iodide or mistura ferri et ammonio acetatis, hypophosphites, and cod-liver oil.

Masticatory spasm, if other than acute (which is sometimes excited by a chill, when it can be relieved by warm applications), requires the same treatment as facial tic, of which it forms a part.

The spasms which have been enumerated above and which are dependent upon the neurosis hysteria do not require treatment different from other hysterical manifestations. For their temporary relief I know of nothing that is more reliable than a mixture of belladonna and bromide of potassium, the former given up to its physiological effects. Other anti-spasmodics, such as valerian, asafœtida, chloral, etc., may be administered, but they are rarely necessary.

THE DRUG HABITS.

By F. X. DERCUM, M. D.

Drug habits present so many complex questions that it is necessary to consider briefly their nature and etiology before attempting to discuss their treatment. Roughly speaking they occur by preference in three groups of individuals: first, in those in whom there is a neurasthenia either hereditary or acquired; secondly, in those in whom a habit has followed the prolonged use of a narcotic or sedative prescribed for some illness; and, thirdly, in those in whom a habit has been acquired incidentally to social life. The first class is separable, as indicated, into—first, those in whom the habit is associated with hereditary or congenital neurasthenia; and, secondly, those in whom the habit is associated with acquired neurasthenia.

It has long been known—indeed, it is a matter of lay experience—that some of these habits, especially alcoholism, are hereditary, and pass sometimes uninterruptedly from generation to generation. It behooves us, therefore, to consider, first, as far as may be done, the characteristics of the constitution in which hereditary inebriety occurs. As a rule, there is a more or less pronounced family history of neurasthenia, of headaches, and other functional nervous troubles. In addition a neuropathic element may be present; thus it sometimes happens that in the same family in which hereditary inebriety occurs there are also instances of the insane neurosis, of marked eccentricity of character, or of excessive precocity or genius running hand in hand with imbecility and idiocy. In cases presenting such a history, treatment, it is needless to say, is very unpromising. In cases in which the family history suggests merely an hereditary neurasthenia the outlook is somewhat better, provided measures can be instituted controlling the manner of living, occupation, and other factors involving the degree of nervous strain to which the individual is subjected.

In cases belonging to the second subdivision of the first named group—those, in which the drug habit occurs as a result of acquired neurasthenia—the problem of treatment is an essentially different one, and decidedly more hopeful. Here, evidently, the treatment is to be directed to the underlying nervous exhaustion. Again, in considering cases in which the drug habit is acquired as the result of the

long-continued use of a drug or stimulant prescribed medically, we should remember that persons of a normal nervous organization are not likely to form pernicious habits under even these circumstances, and if such a habit be formed the suspicion is justified that an hereditary neurasthenia or a neuropathic factor is at work. Thus, if after the treatment of a case of typhoid fever it is found that the patient has acquired the alcoholic habit, we should inquire as to a family history of inebriety or of various functional nervous troubles suggesting neurasthenia or neuropathic conditions. To strictly normal individuals, the use of stimulants—and we speak in this connection especially of alcohol—beyond the limits prescribed by ordinary social usage, is unpleasant and distasteful; and even when as the result of special social occasions alcohol is taken to excess by such persons, a disgust for the drug ensues which leads to a period of relative abstinence. In neurasthenic and especially in neuropathic individuals, the after-depression from the excessive use of stimulants is so great, and is accompanied by so much psychic pain and physical suffering, that a craving for the drug ensues.

Inebriates, especially alcoholics, are also separable into two classes as follows: first, those in which the drug or stimulant is used habitually, day after day—of this class the so-called moderate drinker is typical; secondly, those in which the stimulant is taken at regularly or irregularly recurring periods, the intervals between the attacks being characterized by more or less complete abstinence. In such persons an attack may be provoked by unusual nervous overstrain, or may recur at certain physiological periods such as the menstrual epoch. Again, it may be provoked by the use of a stimulant socially or in accordance with medical advice. To this class especially belongs the periodic inebriate, the one who goes "on sprees."

The above remarks, while they apply in part to other drugs, apply especially to alcohol. Other drug habits, it may be here stated, present peculiarities of their own. At the same time, the general statements applicable to alcoholism apply in a great measure to them. It would seem proper, therefore, to give to alcoholism our first attention.

ACUTE ALCOHOLISM.

Alcoholism occurs in two primary forms: (1) Acute alcoholism; (2) Chronic alcoholism. Chronic alcoholism occurs, as we have just seen, in the continued and the periodic forms.

We will consider, first, acute alcoholism. Acute alcoholism varies from conditions in which there are present transient exaltation or

delirium to those in which there is present profound coma, and, if the excess be repeated for several days in succession, a condition at last ensues characterized by acute and violent delirium and grave signs of exhaustion, the so-called *mania a potu* or delirium tremens.

With the attack of acute alcoholic intoxication we have, in the consideration of drug habits, really little to do. A few words, however, as to the management of such an attack may not be out of place. If there is reason to believe that there are still large quantities of unabsorbed alcohol in the stomach, free vomiting should be induced, either by the administration of copious draughts of warm water, of mustard, or of other remedies by means of which the stomach may be readily evacuated. Subsequently, or even without the previous administration of an emetic, it may be of advantage to administer a brisk cathartic, and to this end a saline purge such as a full dose of Epsom salts is frequently efficacious. At times it is better to administer a pill of blue mass or calomel, before giving the salts.

If a Turkish bath be available this measure may also be instituted. The Turkish bath stimulates the skin to such a degree that the poison is rapidly eliminated, and probably it also stimulates the elimination of the drug by the lungs. It is not an uncommon experience with some men to become intoxicated at a dinner and then after repairing to a Turkish bath emerge at the end of an hour or more almost if not completely sober. If the Turkish bath be not available a full hot bath in an ordinary tub is often efficacious.

Measures should also be instituted for averting the post-alcoholic headache, which in many cases is often of great severity. It is well, therefore, after having given a Turkish or hot bath, before allowing the patient to rest or go to bed, to administer a full dose of one of the bromides, say a drachm. This remedy is so efficacious, indeed, that in many cases in which the bath is not available, the bromide itself permits the patient to awaken the following morning with little or no cephalic distress. The effect of the bromides is much increased by combination with a dose of antipyrin. Caffeine also is useful. Various combinations of the bromides with caffeine are sold in the form of effervescing draughts by druggists.

Treatment of Delirium Tremens.

If the alcoholic debauch has been sufficiently prolonged and sufficiently deep, the condition known as delirium tremens or *mania a potu* supervenes. Measures should at once be instituted, such as are indicated in ordinary delirium when associated with profound exhaustion. Almost always a certain amount of physical restraint becomes necessary, and this is best accomplished by fastening the patient in

bed by means of sheets drawn firmly over his body or over his limbs, but in so doing we should be careful not to impede respiration. Often it is necessary to put leather gauntlets on the wrists and ankles.

As in other asthenic states, a treatment should be adopted the aim of which is to support the strength of the patient. Milk, eggs, beef-tea, beef-peptonoids, and other beef preparations should be employed. These should be given in as large quantities as it is possible to administer, and at short intervals, say of one or two hours. At the same time strychnine and digitalis should also be given, the former in doses from $\frac{1}{40}$ to $\frac{1}{20}$ of a grain every four hours. It should be administered hypodermically. Some judgment is, however, necessary in this respect, inasmuch as the insertion of the syringe frequently increases the terror of the patient and enhances his hallucinatory delusions. Digitalis should be given in from 8 to 15 or 20 drops at a like interval (four hours), the dose being guided by the condition of the pulse.

Whether alcohol should be administered in a given case is a matter requiring careful consideration. As a rule it is necessary to give a certain amount of alcohol; sometimes it must be given very freely. It will be found, however, that in many cases in which forced feeding is practised, and in which full doses of strychnine and digitalis are being administered, the alcohol can be limited to relatively small quantities. However, when in spite of other measures the pulse fails and becomes very frequent and weak, and the skin becomes cold and clammy, alcohol must be given in full doses.

In the majority of cases the physician is also compelled to resort to various sedatives in order to induce sleep. It is the habit of the writer to prescribe a combination of bromide, morphine, and chloral. As a rule such a combination is very efficacious. It should contain a maximum amount of bromide and but moderate amounts of chloral and morphine. The bromide, which should preferably be in the form of bromide of ammonium, should be administered in 1-drachm doses, while the chloral should be given in doses of but 10 or 15 grains and the morphine in doses of $\frac{1}{4}$ of a grain. It is found, as a matter of experience, that in these patients sleep is induced with the greatest difficulty, especially in the beginning of the attack, and it is also well to bear in mind that hypnotics are capable of doing harm as well as good, and the doses should therefore not be too frequently repeated. Sometimes, however, it is absolutely necessary to increase the dose of morphine. At other times the extract of opium is advantageously substituted. Frequently, also, instead of pushing the mixture of bromide, chloral, and morphine just mentioned the writer makes use, in addition, of moderate doses of trional, say 10 to 20 grains. Hyoscine hydrobromate, gr. $\frac{1}{100}$ to $\frac{1}{50}$, may also be used, though in the hands of the writer it has not in this class of cases given much satis-

faction. We should remember that if sleep be very difficult to induce, it is far better to tide over the restlessness by moderate doses of hypnotics than to push these excessively, especially as in the majority of cases sleep is quite readily induced on the second and almost always on the third or fourth day. As a rule, also, in cases that are properly fed and in whom strychnine and digitalis are used judiciously, sleep intervenes without the excessive use of the narcotics. Sleep having been once established, it is a small matter to keep up feeding and sleep until the attack has passed away.

Not infrequently delirium tremens is complicated by pneumonia, and then the patient's condition is indeed serious. In such cases the supporting measures already discussed are doubly indicated. De Tours very properly points out that in this state opiates should be given in small doses, while alcohol should be given in abundance.

CHRONIC ALCOHOLISM.

In chronic alcoholism, the fact of an underlying neurasthenic or of a more serious neuropathic element is usually so evident that one is surprised to find how little it is taken into account in the various special methods of treatment in vogue. We find, it is true, that during withdrawal, tonics by the mouth and various drugs, such as strychnine and atropine, hypodermically are recommended, but no real attention is paid to the underlying nervous disorder itself. The importance of taking this factor into account and the success so frequently attendant upon such a plan will be presently pointed out.

Prognosis.—Before a plan of treatment is instituted we are invariably asked to give a prognosis, and into this, as has already been shown, various elements enter. Everything depends upon the family and personal history, and especially the manner in which the habit was formed. Thus the prognosis is most favorable, other things being equal, in cases in which there is a history pointing to an acquired neurasthenia; it is less favorable if the facts point to an hereditary or congenital neurasthenia; it is still less favorable if neuropathic features such as have been already dwelt upon are present, and is almost hopeless if, in addition, a history of confirmed hereditary inebriety is present. Further, other things equal, the prognosis is most favorable in cases in which the habit has been formed as a result of social drinking, less favorable in those in which it has resulted from, or been incidental to, some severe illness, and least favorable in cases in which it has arisen spontaneously in the form of solitary drinking.

Having determined as far as possible the etiology of a given case

of alcoholism and the degree in which neurasthenia or neuropathic features are present, it becomes necessary to study the physical condition of the patient to determine the presence or absence of organic visceral disease. To this end the liver should be carefully studied, bearing in mind of course the relation of alcoholism to cirrhosis. The heart and blood-vessels should be examined, bearing in mind fatty and atheromatous changes. Similarly careful studies of the urine should be made with a view to detecting chronic renal disease. The lungs also should receive a due share of attention; it is unnecessary to point out the significance of possible changes in these structures save to mention the not infrequent coexistence of phthisis and alcoholism, and the further fact that many confined alcoholics suffer from chronic bronchitis. The digestive tract demands a very large share of our attention. Almost invariably there is present a marked chronic gastritis which above all things must be taken into consideration in the scientific treatment of the disease.

Treatment.

Having carefully studied our patient, the first problem that presents itself is the question of withdrawal of the drug. While opinions differ, it is in the writer's experience always best to attempt rapid or immediate withdrawal. If no recent exacerbation has occurred, this can as a rule be accomplished without much difficulty; if, however, the patient is just passing through an alcoholic attack or has recently committed more than the usual excesses, the withdrawal will have to be more gradual. The moral effect of a too gradual or too prolonged withdrawal is bad, and, as already stated, a withdrawal as rapid as is consistent with safety should be instituted. We should be guided largely by the nervous symptoms and by the action of the heart. Collapse, mental confusion, delirium, and excessive prostration of course demand a very gradual withdrawal. Whenever possible the alcohol should be given with food.

Having decided the question as to the rate of withdrawal, it now becomes necessary to lay out a plan of treatment. Drugs, so much dwelt upon by others, are assigned a secondary value by the writer. In his judgment, natural therapeutic measures are far more important and lead to far more satisfactory and durable results. As we shall see, they are readily applicable to the underlying nervous disorders so commonly present in these cases. Drugs may, however, be used at the same time with advantage. But their employment depends upon each individual case. No routine method of their application, no one drug, no one formula can be considered as applicable to every case. The use of a given drug depends entirely upon the symptoms present and varies with each case.

What special method, then, shall we adopt of treating the continuous form of alcoholism? It is of course evident that if neurasthenic features be present and are treated, if the general tone and vigor be improved, the desire for stimulants will be lessened. In some cases it is possible merely by strict attention to hygiene; to matters of diet; to hours of sleep and regulation of the various functions, to bring about a favorable result, but in the majority of cases such simple means will not suffice, and it is necessary to institute measures involving some degree of restraint. Unfortunately, as civilized governments are at present constituted, forcible measures of restraint, except in very unusual cases, cannot be carried out, and there is at present no prospect of legislation upon this subject—so great is the prejudice against the interference with the liberty of the individual. If possible, however, the consent of the patient to comply with certain conditions of treatment should be gained. In a few instances the exaction of a promise or the signing of the pledge will suffice. In others again, and in by far the larger number of cases, more decided measures are necessary.

Men occasionally enter institutions for the treatment of inebriety voluntarily, and often, under the moral and social restraints of such asylums, the use of the drug is discontinued. A far better way—an ideal plan, but unfortunately a somewhat expensive one—consists in withdrawing the patient from his ordinary surroundings and instituting a system of absolute isolation and at the same time placing him in the care of a specially trained nurse. Such a plan as this is, in suitable cases, almost invariably followed by the most gratifying results—results which also are far-reaching and frequently permanent; for the isolation of the patient gives the physician the very best of opportunities for the study of the morbid conditions underlying the disease and for their proper treatment.

The plan of the writer is to institute a form of so-called "rest treatment." This plan, indeed, is followed in many cases even when the patient is not markedly neurasthenic, for the isolation in a room with a special nurse constitutes the most effective means of restraint that can be devised, while the moral effect is of the very best. It is the plan of the writer to place the patient *in bed* and to keep him in bed, not for days but for many weeks, and to institute at the same time massage, baths, Swedish movements, electricity, and such other expedients as suggest themselves from time to time or are indicated by the case. It cannot be too strongly insisted upon that the victim of alcoholism is the victim of disease, and that very frequently the relief obtained from various distressing symptoms by merely remaining in bed is so great as to be followed by a rapid diminution in the appetite for the stimulant.

The patient having been placed in bed, it is frequently found necessary to administer small doses of calomel and to follow these after a time by a saline cathartic. The digestive tract having thus been prepared, systematic feeding should be commenced. As a rule, it is best to begin with a liquid diet. This should at first be limited to beef-tea, broths, soups, and meat preparations generally. As soon as possible, however, a milk diet should be instituted. A great many alcoholics aver that they cannot take milk; that it increases the coating of the tongue, and that its ingestion is followed by nausea and loss of appetite; but as a rule we shall be able to administer milk if the proper precautions are observed. The simple expedient of adding a little alcohol answers every purpose, for it is then readily tolerated by the stomach and acceptable to the patient. At other times, instead of adding alcohol to the milk our purpose is answered by diluting the milk with some carbonated water such as soda-water or Apollinaris. In other instances, again, it is a good plan to peptonize the milk. The cold process is generally preferable, inasmuch as the taste of warm peptonized milk is so unpleasant to the average alcoholic that he will usually reject it. It is a good plan to add the peptonizing powder to the milk just before the latter is administered. Sometimes it is necessary to abandon whole milk and to give the patient skimmed milk or buttermilk. With regard to the amount of the milk, it is best to begin with a very small quantity, say three or four ounces given at intervals of two hours. Many patients who cannot take milk in large quantities can take it in small amounts at short intervals and digest it without difficulty. It will also be noticed that the quality of milk thus administered in twenty-four hours is insufficient to satisfy the wants of the patient. In two or three days as a rule, especially if the intestinal tract has been thoroughly emptied by the administration of calomel and salts, the patient becomes very hungry and accepts the small doses of milk eagerly. The amount of milk should then be gradually increased, an ounce being added to each dose daily.

It will be found expedient in a very few days, at most four or five, to begin with solid food; we should begin, of course, with small quantities. It may consist of soft-boiled eggs, Hamburg steak, boiled rice, stale bread, etc. Little by little the patient may be brought up to a full diet, the milk at the same time being increased. In other words, we apply to the treatment of an alcoholic patient the general principles of diet in the rest cure. Very soon it will be found that the patient is taking a very large amount of food, and that his condition is rapidly changing for the better. The nervousness resulting from the withdrawal of the alcohol subsides and the desire for the latter diminishes. His spirits also rapidly improve, the depression disappears, and he becomes bright and cheerful.

During all this time, it must be remembered, the patient is receiving daily full general massage and sponge, shower, or spray baths, while the muscles are stimulated by electricity—usually the slowly interrupted faradic current. As the cases progresses, Swedish movements with resistance are added. Soon it becomes necessary to permit the patient to leave his bed for small portions of time daily, until at the end of five, six, or more weeks he is up the greater part of the time. As soon as this is the case calisthenics and other room-exercises are instituted. Subsequently, according to the progress of the case, this should be followed by exercise in the open air—always, of course, in the company of the nurse.

It may occur to the reader that in chronic alcoholics a large amount of forced feeding such as I have here suggested is not indicated. A few minutes' reflection, however, suffice to convince us of the erroneousness of this view. In the first place, whiskey- and wine-drinkers are not apt to be obese. Even if they are, their tissues are soft, flabby, and in a badly nourished condition. Those patients in whom the greatest obesity occurs, namely, beer-drinkers, rarely come under our care or treatment as alcoholic subjects. Should, however, the alcoholic subject be obese, this feature must be taken into consideration in the dietary. It is hardly necessary to say that, in such cases, whole milk should be substituted by skimmed milk, that starches and fats should be as far as possible excluded, and that lean meats, fish, green vegetables, etc., should be given; in short, we should adopt the ordinary diet for the reduction of obesity. In the experience of the writer the greatest number of those who come under our care for chronic alcoholism are not persons who are obese, but rather patients in whom the weight is distinctly below the normal; some, indeed, are excessively thin.

Occasionally it is possible to conduct the entire treatment without the use of drugs, but, as a rule, the latter may be advantageously employed. Indeed, most frequently they are indicated. They are roughly grouped into three categories: first, those indicated by the symptoms arising from the withdrawal of the alcohol; secondly, those indicated by the deranged visceral functions; and, thirdly, those which are tonic, stimulating, or antagonistic to the action of alcohol.

The symptoms which arise upon withdrawal consist especially of markedly increased nervousness, of insomnia and sometimes of headaches. As a rule, the indications can readily be met by the exhibition of the bromides. These may be given in doses of from 20 to 40 grains every four hours. The insomnia may be combated by trional (gr. xx), and, if this be not efficacious, by sulphonal (gr. xv to xx) or hyoscine hydrobromate (gr. $\frac{1}{100}$ to $\frac{1}{60}$). The use of morphine is unjustifiable. Chloral may be used, but it had better be avoided.

As already stated there is almost always present a gastric catarrh, and this must be taken into consideration not only in the diet but also in the medicines prescribed. Nitrate of silver, gr. $\frac{1}{4}$, combined in pill form with extract of hyoscyamus, gr. $\frac{1}{4}$, and administered three times daily a half-hour or twenty minutes before meals, has, as a rule, a very happy action. Occasionally, however, lavage is necessary—though this, even in severe cases, need not be continued very long. Occasionally the morning nausea and vomiting of chronic alcoholics is very troublesome, but, as a rule, this readily subsides. Sometimes small doses of calomel are indicated, and in others phosphate of sodium can be given with advantage. The latter is best administered in doses of 15 grains in hot water early in the morning. At other times it may be given in an effervescent solution and repeated several times daily. Small doses of saline laxatives are also frequently of service during the first week or ten days of treatment.

The third category of drugs, as already stated, includes those which are tonic, stimulating, or possibly antagonistic to the action of alcohol, and it is unfortunately to these more than anything else that attention has been directed both by medical authors and by the advertising pretenders of specific cures. The writer does not deny that some of them are of value; in fact, he not infrequently makes use of them, but it cannot be too strongly insisted upon that they should not constitute the main factor of the treatment. They are merely adjuvants, and if employed at all should be selected and adapted to each particular case. The drug most commonly resorted to is strychnine. It is generally given hypodermically in the form of the nitrate. As a rule, it should be employed in moderate doses, say gr. $\frac{1}{30}$ or $\frac{1}{40}$, three times daily; although occasionally much larger doses, gr. $\frac{1}{20}$ or even $\frac{1}{15}$ (Dana[1]) may be given. In the writer's experience, however, large doses over-stimulate and tend to increase the nervousness of the patient. There can be no doubt that in most cases strychnine is beneficial, and that it markedly diminishes the depression of the period of withdrawal, and it may even tend, as is claimed by Phelps,[2] to impair the appetite for alcohol. Though it has not in the writer's experience so valuable a property, no harm can be done by its use, especially in moderate doses. In many cases we must admit that its use is followed by most gratifying results.

Another drug which is quite freely used is atropine. Its stimulating qualities are apparently of much service in many cases of alcoholism. Like strychnine it appears to lessen the depression caused by the withdrawal. It seems to diminish especially the distressing epigastric and sinking sensations from which alcoholics suffer. It

[1] *Post-Graduate*, New York, July, 1896.

[2] *Medical Fortnightly*, St. Louis, 1895, viii.

should be administered hypodermically in doses varying from gr. $\frac{1}{100}$ to $\frac{1}{50}$, three times daily, and preferably with strychnine. Clark[1] regards the combination with strychnine as almost a specific. He maintains that while strychnine acts as a nerve-tonic, the atropine has a special aptitude for decreasing the appetite for alcohol. Carter[2] also regards atropine as of special value. He declares that atropine given three or four times a day will produce a great distaste for alcohol in from one to five days—that whiskey becomes repellant both as regards sight and odor, and that its taste becomes intolerable, producing nausea. While this position is somewhat extreme, there can be no doubt that in cases in which there is marked depression with coldness and clamminess of the extremities the drug is extremely valuable, and it is not impossible that by combating these symptoms the atropine may indirectly lessen the craving for alcohol.

Among other drugs that are of use from time to time we should mention arsenic, iron, and bitter tonics. As regards the latter we should be careful, of course, not to prescribe them in the form of tinctures. As a rule, their exhibition in pill form with or without a small quantity of capsicum answers every purpose. Arsenic, if given at all, should be in the form of Fowler's solution and should be given well diluted for fear that the chronic gastric catarrh, almost invariably present, might be aggravated. The writer has found it of distinct value, especially in the latter part of the treatment. If iron be indicated it should be exhibited in the form of a peptonate, preferably associated with manganese.

A drug that has been brought into great notoriety in connection with alcoholism is the chloride of gold and sodium. It is not many years since that as "bichloride of gold" it was heralded far and wide by advertising pretenders as a specific for alcoholism. As a matter of fact the drug is almost inert, its action being that of an extremely feeble tonic and alterative unless it be given in large doses, when it acts as a gastro-intestinal irritant. Notwithstanding, there are not wanting medical writers who vaunt its merits, *e. g.* Oliver Edwards,[3] who ascribes to it not only peculiar specific properties but also declares that it brings about refreshing sleep and other equally remarkable things. It is very probable that the virtues attributed to the gold salt are really to be attributed to the concomitant use of strychnine and atropine. Carter is evidently of a similar opinion when he says that the antagonism existing between atropine and alcohol is the real basis of the gold cure.

Apomorphine is also occasionally used in the treatment of alcoholism, especially in systems of treatment in which the patient is allowed

[1] *New Orleans Medical Journal*, vol. xxiii. p. 721.
[2] *Medical News*, March 9, 1895. [3] *Canada Medical Journal*, March, 1896.

all the alcohol he desires. If, in spite of the administration of strychnine and atropine, the patient continues drinking, apomorphine, gr. $\frac{1}{16}$, is given hypodermically at such times as the alcohol is taken. How unscientific this method is need not be pointed out. Comment is unnecessary. The same is true of any method of treatment which involves the substitution of another drug, such as morphine, cocaine, or chloral, for the alcohol: such practice cannot be too strongly condemned.

The writer is in the habit of applying to every case as far as possible the general principles of the rest treatment and employing strychnine, atropine, and other drugs only when indicated. It is certainly unscientific to treat every case in the same way. In cases treated on rest principles it will almost always be found, long before the treatment has been completed, in fact often before it is well under way, that the patient's appetite for alcohol has entirely disappeared. It will be found, further, after the treatment has been completed, that the tendency to relapse is very slight. It is all-important, of course, to guard the patient against exposure to fatigue, alcoholic subjects being very readily exhausted. This fact should be constantly borne in mind when the time comes for the patient to resume the ordinary duties of his vocation. The majority of cases of relapse are those in which some indiscretion, either in the direction of overwork or repeated attendance upon social functions that are attended by loss of sleep, has occurred.

The greatest difficulty is presented by those cases in whom there is a strong hereditary or neuropathic element. These are the cases in which drunkenness comes on in periods or well-defined attacks. It must be frankly confessed that in cases of this kind nothing short of forcible intervention and restriction is efficacious, and this forcible measure, as already pointed out, cannot be carried out in this country. Drunkards demand the same care as the insane, and special institutions or special control should be provided for them. In Austria a procedure known as the *Curatel* has been instituted. This consists in the legal appointment of a curator or administrator who acts in the capacity of guardian. Under the same provision public asylums for drunkards have also been established and they have met much favor. In this country we are compelled to resort to other and less effectual means. However, if it be possible to induce a periodic drinker to submit to a prolonged course of rest treatment, followed by exercise, the danger of recurrence of the attacks may be lessened. At any rate, in the management of such an individual, everything should be done toward keeping the organism at as high a physiological level as possible, paying careful attention to every function. We should be careful further to point out to such a patient the danger of

subjecting himself to severe nervous or other strain and to enforce, as much as possible, such a regularity of living that abundant time is given for sleep and for the digestion of food.

In treating alcoholics it is important also to study special symptoms, such as the neuralgic pains and headaches which they present, while we must also be on the lookout for signs of actual organic disease either of the nerve-centres or of the peripheral nerves. These will demand various additions or modifications of the general plan of treatment. It is remarkable, however, how thoroughly and completely these symptoms, as a rule, disappear during rest. Even mental impairment, as indicated by loss of memory, feebleness of will and judgment, and impairment of the moral sense, is capable of great improvement.

Of late years hypnotism has been suggested as a mode of treatment for alcoholism, more especially by Forel. Of its efficacy the writer has no personal knowledge. It is very doubtful whether any method of treatment which fails to recognize fully the pathological groundwork underlying the alcoholic habit can be successful. Certainly in all but very slight cases this can be no more powerful than in actual organic diseases. Crothers points out that alcoholics are, as a rule, very poor subjects for hypnotism.

MORPHINISM.

The treatment of morphinism resolves itself into the treatment of the habitual and of the occasional users of the drug. There are some patients who, like the periodic alcoholics, make use of morphine or of opium only at certain periods and then again voluntarily abandon the drug. It is a common thing to find persons who suffer from recurring attacks of headache or neuralgia, or from menstrual troubles, periodic users of morphine. Women especially are prone to such periodic habits. However, whether the drug be used occasionally or periodically, the problem of treatment remains essentially the same; but, as can be readily inferred, the treatment of the periodic users of the drug is far more difficult than that of those who use the drug continually. In this connection it may also be pointed out that it is as a rule less difficult to treat successfully a patient who uses relatively large quantities of the drug but has done so for a short time only, than one who uses only small quantities but has used them for many years.

Various methods of treatment are in vogue, all of which, however, lay special stress upon the method of withdrawal of the drug. For instance, some writers advise immediate withdrawal; others rapid

withdrawal, and others very gradual withdrawal. Thus Gilles de la Tourette advises sudden withdrawal if the patient has been taking large doses, say 5 to 6 grains daily, and gradual withdrawal if the patient has been taking less than 5 grains; while Comby advises invariably sudden withdrawal. According to the writer's experience, it is best at first not to consider the question of withdrawal at all, but merely to institute such general measures as have been already indicated in the sections on Alcoholism. Here, again, no treatment is so efficacious as that of full rest methods. Partial rest methods fail. Full rest methods on the other hand are crowned with success. As in the case of alcoholism the patient should be placed in bed, should be carefully isolated, and should be placed upon a diet especially adapted to the case—one which contains large amounts of milk, fruit, and vegetables, and a relatively small amount of beef. The remarks already made in regard to the diet in alcoholism apply with but slight modifications here. As a rule the white meats (fish, oysters, breast of fowl, etc.) are not only well digested but are found more beneficial than the red meats (beef, lamb, etc.). Rice again presents itself as an admirable article of diet. In addition to the rest and the special feeding, bathing, massage, and electricity should be systematically employed.

It is the practice of the writer not to begin withdrawal of the drug until after rest treatment is fully under way. We must remember that the morphine *habitué* labors under an excessive fear lest the drug be withdrawn too soon. Besides, sudden withdrawal always implies a period of frightful physical and mental suffering. Further, the patient is, as a rule, intensely distrustful. I know of no class of patients with whom it is more difficult to establish friendly relations or in whom it is more difficult to inspire confidence. However, if the patient learns after his first few days of rest and isolation that he is still receiving his hypodermic injections or that he is still being allowed his usual quantity of laudanum or opium, confidence sooner or later asserts itself, especially as the physical comfort resulting from the bathing, massage, and proper diet soon becomes pronounced.

The practice of the writer is almost invariably that of very gradual withdrawal. The withdrawal should be so slow at first that the diminution of the dose is practically imperceptible; later on, the reduction may be more rapid. If the patient has been in the habit of receiving hypodermic injections it is the plan of the writer not only to gradually reduce the dose in the manner indicated but also to begin adding to the injection small doses of the nitrate of strychnine, say $\frac{1}{50}$ of a grain, and if the skin be very moist small doses of atropine sulphate, say $\frac{1}{200}$ of a grain. It is needless to say that after the morphine has been discontinued entirely, hypodermic injections of strychnine

or of strychnine and atropine may be kept up for some time without informing the patient of the change. The physician should be especially cautioned not to make use of cocaine during withdrawal, or in fact at any time, inasmuch as the patient may sooner or later acquire the cocaine habit with results equally disastrous. Besides, a large number of patients that come under our care for the morphine habit have already acquired the cocaine habit. The same remarks apply to the use of alcohol. Many of our cases, indeed, are instances of the "triple" habit, namely morphine, cocaine, and alcohol.

In the management of morphine cases isolation is absolutely imperative. No one should have access to the room save the nurse and the physician. No letters, packages, or newspapers should be admitted to the room under any pretext. Patients practise all sorts of devices to secure possession of the drug. Bribery is attempted with servants, or an order for the drug may be written on a piece of paper, the paper wrapped about a coin and the missive thrown out of a window; in the writer's experience this method has several times enabled the patient to procure the drug. It is remarkable also to what extent friends and relatives will enter into collusion with the patient to supply them with the stimulant, all fearing that the doctor is practising great cruelty and is withdrawing the drug too rapidly. Vigilance in such cases cannot be too great.

The reason for withdrawing the drug in the gradual manner above described is not only to diminish the sufferings of the patient, but also to prevent the onset of serious symptoms. Every now and then, if the drug be abruptly withdrawn, all of the signs of collapse, diarrhœa, sweating, cardiac weakness and dyspnœa, with excessive prostration, may set in. In other cases, again, mental symptoms resembling those of confusional insanity make their appearance, the patient becoming hallucinatory, delusional, and finally delirious. Such symptoms are not apt to make their appearance if the drug be withdrawn in the manner indicated and under fully established rest conditions.

The treatment of the morphine habit by the rest method should be continued for a very long period. In the writer's experience, the period which is sufficient for ordinary cases of neurasthenia or hysteria is totally insufficient for cases of morphinism. A course of three months of treatment is as a rule absolutely demanded, and in many patients the treatment should embrace five, six, or even seven months. The writer does not mean to imply that the patient should be kept in bed during all of this period, but that full rest methods should be kept up for from three to four months, and after this a partial rest treatment should be instituted, the patient being up and out of bed and exercising out of doors daily for some three or four hours. In cases so treated the writer has met with most gratifying results.

Success, it need hardly be stated, is still further assured if the patient's nurse accompany her to her home or elsewhere and remain with her for a period of several months longer. If practicable, the entire length of treatment under the supervision of the nurse should extend over a year. In no class of patients is relapse so apt to occur as in morphine cases, and it is for this reason that every possible precaution should be taken, provided the patient's means permit it.

With regard to the management of morphine cases subsequent to the rest treatment, the general principles already indicated in the sections on Alcoholism are applicable here. Everything should be done in the way of proper diet and exercise to keep the patient's health at as high a level as possible. But here also it is important to avoid fatigue and especially strain, excitement, and worry. Many cases presenting special difficulties are cases in which the habit has been acquired for the relief of a painful affection which still continues—as, for example, a persistent neuralgia, frequently recurring headache, or painful menstruation. It is needless to point out that every effort should be made to discover, and if possible eradicate, the cause of the painful affection whatever it may be, treating the headache or neuralgia upon such principles as are indicated, or if functional or organic disease of special structures be present, *e. g.* pelvic disorders in women, instituting such means, medical or surgical, as are necessary.

Because morphine patients are so untrustworthy, and because the means of obtaining the drug save under absolute isolation are so many, the physician should carefully watch the patient in order to learn whether the drug is really being withdrawn. Absolute supervision is only possible under absolute isolation, and yet by the most unexpected means the patient may be placed in possession of the coveted stimulant. However, if the quantity of the drug administered is really being diminished, certain symptoms inevitably make their appearance. They are, first, restlessness which may become very marked and is accompanied by more or less insomnia. The patient also yawns a great deal or sneezes, complains perhaps of having caught a slight cold, or perhaps has an attack of difficult respiration simulating asthma. In addition to restlessness the patient manifests signs of fear, complains of a sense of oppression, declares himself dissatisfied with the treatment, and insists upon going home. Involuntary movements of the legs and arms also make their appearance, the limbs being thrown about the bed. At times this is merely due to restlessness, at other times distinct involuntary jerkings make their appearance. Intention tremor also becomes evident. When, for instance, the patient attempts to pick up a glass of water it is noticed that he trembles decidedly. Sometimes instead of an asthmatic attack all the symptoms referable to a cold in the head or a spasmodic

cough may make their appearance. Sometimes vesical tenesmus is noticed. Palpitation of the heart may be also evident, or the patient may complain of fluttering sensations in the præcordia.

It stands to reason that, if none of the above symptoms are present and if the patient continues comfortable and in good spirits, sleeps well, and is contented with his surroundings, he is obtaining the drug surreptitiously. It should be remembered that even under very gradual withdrawal some of the symptoms above mentioned make their appearance, and may indeed become so marked as to necessitate for a time a return to a larger quantity of the drug. No picture is more alarming than that often presented by morphine patients in the stage of withdrawal, especially if the depression produced by the vomiting and diarrhœa be accompanied by mental confusion and delirium. These symptoms cannot be relieved by other remedies, and a recourse to morphine for a time is not only indicated, but is really the only course to pursue. The history of withdrawal in a confirmed case of morphinism is, in the experience of the writer, not a steady and unbroken decrease in the quantity of the drug, but consists of a series of diminutions, the progressive decrease being every now and then broken by a return to a slightly larger quantity. The detailed method of diminution depends largely upon the individual case under treatment. The writer, as a rule, continues for a number of days the quantity of morphine which the patient habitually takes; he then begins the diminishing of doses given in the early portion of the day; those given at night are continued in full quantity for a somewhat longer period. This is contrary to the practice of others, who begin by diminishing the evening doses. In the writer's experience, cutting off the evening doses makes the patient restless and sleepless, while the diminution of the morning dose, though producing restlessness, is not attended by the great disadvantage resulting from insomnia and its attendant evils. No hard and fast rule can, however, be said to apply. The patient should be given the drug when he needs it most, and it should be first diminished or withdrawn at those periods when he needs it least. Inasmuch as morphine injected hypodermically is eliminated by the stomach and is subsequently reabsorbed by the intestines, Hitzig has suggested that in treating morphinism we should systematically wash out the stomach. This seems to the writer to be an unnecessary precaution. The procedure is one that adds greatly to the distress from which the patient is already suffering, and it is doubtful whether the morphine thus gotten rid of is really large in amount.

As already stated, during withdrawal we should make free use of hypodermic injections of strychnine nitrate and atropine sulphate. As in the management of alcoholism, the dose must be adapted to

each case. In morphinism much larger doses of these drugs are tolerated. However, in many cases it is possible to bring about withdrawal without their use. Occasionally it is a good plan to use digitalis or strophanthus. As the treatment progresses, and during the convalescent period, bitter tonics, mineral acids, iron, arsenic, malt, and other nutrients may be added as may seem expedient.

Among drugs to which especial virtue in the treatment of morphinism has been ascribed we should mention the phosphate of sodium. It has been especially advocated by Luys.[1] He believes that it has a supporting action on the nervous system and should be given hypodermically. Beyond purely theoretical considerations the drug has nothing to recommend it. Codeine, which is recommended by Skene, Mattison, and more recently by Keugla,[2] is merely a makeshift substitute and should not be resorted to. Caffeine, also recommended by some writers, may occasionally be used in cases in which withdrawal is followed by great depression or in cases in which the early morning depression is very marked. It is best administered hypodermically. It should not be given toward evening for fear of adding to the insomnia. Insomnia and restlessness not infrequently demand the use of the bromides. The bromide of ammonium may be given in doses of 30 to 40 grains at intervals of four hours. Trional may be used in its stead, especially toward night. At times sulphonal may be given, but if possible it should be avoided, as should also chloral, as both of these drugs favor the confusional delirium occasionally met with in severe morphinism. The hot bath offers a harmless and often a very efficient method of combating the insomnia. Suggestion, advocated by some writers, with or without hypnotism, is of little or no value in the treatment.

A discussion of the treatment of morphinism is perhaps incomplete without referring to one of the means by which the habit is often brought about and perpetuated—a means, moreover, which is largely under our own control. A painful fact thrusts itself upon us in that the morphine habit generally has its origin in the prescription of the drug by a physician for some transient affection. Physicians cannot rid themselves of the great responsibility involved in the abuse of this drug, and it cannot but be admitted that it is too frequently prescribed for comparatively trivial affections and that some physicians are altogether too ready with the use of the hypodermic syringe. Every prescription containing morphine for the relief of pain should be marked above the physician's signature with the imperative order not to be renewed. Refilling a prescription so marked renders a druggist liable to prosecution, and physicians can, by this simple

[1] *Gazette des Hôpitaux*, Paris, 1895.

[2] *Occidental Medical Times*, 1895, xi. p. 541.

expedient, exercise a certain amount of control over their patients. Further prescriptions for the relief of pain should be for a few doses only, and the patient himself should be warned against the unnecessary repetition of the dose. Again, it has a number of times come within the knowledge of the writer that a physician has directed patients to purchase hypodermic syringes in order that he should not be annoyed or disturbed by too frequent calls. Such a course cannot be too strongly condemned. Another and prolific source of the morphine or opium habit is the ease with which narcotics can be purchased by the layman, and although laws exist which forbid the dispensing of poisons and narcotics without physicians' prescriptions, violation of the law is a matter of very common experience.

COCAINISM.

As mentioned in the last section, cocainism is sometimes acquired as a concomitant of the morphine habit or during the unscientific treatment of the latter. A far more frequent cause of the cocaine habit, however, is the use of the drug in the treatment of affections of the nose. Not only is cocaine applied by the surgeon preparatory to the performance of trivial operations, but it not infrequently happens that the patient is furnished with a solution containing cocaine which he is directed to apply either by means of a cotton pledget or by means of a spray. Within the writer's knowledge not a few cases of cocainism can be traced to some misapplication of the drug, the victim not infrequently being himself a physician. In prescribing cocaine for purely local affections we incur a responsibility not less than that which we incur in prescribing morphine. We should never lose sight of the fact that every local application is accompanied by a certain amount of general action. After the use of cocaine over a large mucous surface, such as the nasal chambers, the patient experiences not only local anæsthesia but a comfortable sense of warmth and well-being diffused all over the body. Further, the nerve-centres are stimulated, especially if the doses have been large, very much as they are stimulated with alcohol, save that the stimulation is far more intense and sudden.

A patient upon whose nasal chambers cocaine has been freely used soon becomes talkative, often boastful, but in a little while fatigue and relaxation supervene. Soon he experiences a need for the repetition of the dose, and little by little the habit is established. If the drug be withdrawn for some time, or if the patient fails of access to the stimulant, he is soon seized with a feeling of great discomfort, of

marked oppression, of faintness, palpitation, and general nervousness. There is in addition a marked mental irritability which is manifested by sharpness and shortness of speech and jerkiness of manner. The cocainist soon becomes unable to attend to his business. He becomes readily and excessively fatigued. In a short time also it is noticed that judgment and memory become impaired and his regard for truth becomes as small as that of the morphinist. Often he is full of business which is never completed; he is talkative and boastful, but neglects his obligations. At the same time it is noticed that he is pale and haggard; that his general nutrition is much impaired and that his weight is below normal. Often he presents a picture of premature senility. His reflexes are exaggerated. His movements are those of unrest and constant change of position. At times his muscles are the seat of spasmodic twitchings. His pupils are dilated. Frequently there is tremor of the tongue and sometimes of the hands. His pulse is rapid and he frequently suffers from palpitation. His skin is apt to be cold and moist. He sleeps but little, often indeed insomnia persists for days. In addition he may present various symptoms of mental confusion and delirium. Sometimes he is the victim of delusions of persecution. At other times he becomes, if married, insanely jealous, and may, as in alcoholism, entertain the delusion of marital infidelity.

During the withdrawal of the drug these symptoms become much exaggerated, and we have recounted them in brief in order that the physician may be able to tell whether withdrawal is actually taking place. Contrary to what one might expect, it is, as a rule, practicable to withdraw cocaine far more rapidly than either morphine or alcohol. It is true that insomnia, palpitation, dyspnœa, and collapse are liable to occur, but they can be much more readily controlled. The writer, as a rule, practises immediate withdrawal. The bromides, especially when associated with 5 or 10 grains of antipyrin, are very efficacious in combating the symptoms. Coffee assists materially in lessening the depression during the day, while the insomnia can, as a rule, be readily combated by means of trional or sulphonal. As already stated, the cocaine habit may have been acquired in the attempt to cure the morphine habit and cocainism and morphinism may exist together. In such cases the cocaine may be entirely withdrawn at once. The morphine, however, should be withdrawn in the gradual manner already described. Similarly, the patient may be the victim of the so-called "triple habit," that is, he may use not only morphine and cocaine, but also alcohol. Here the problem presented often taxes our ingenuity. As a general rule, however, it may be stated that it is expedient to withdraw the cocaine at once, the alcohol rapidly, and the morphine slowly. The morphine distinctly overshadows the other drugs, and,

as a rule, it had best be continued in full doses for a number of days. Later it may itself be gradually diminished. In other words, the treatment of this "triple" habit resolves itself sooner or later into that of simple morphinism.

It cannot be too strongly insisted upon that rest and isolation as detailed in the sections on Alcoholism and Morphinism apply equally to the treatment of cocainism. The cocaine patient is as little to be trusted as the morphinist. Confinement in a room under the supervision of a trained nurse, and to which room no other person but the physician has access, presents practically the only favorable prospect of cure. As in the case of morphinism, this isolation should be practised for from two to three months. The general principles already indicated with regard to the use of tonics in the convalescent period of morphinism apply equally here. We should remember that our patient is below weight, and that he presents the symptoms of nervous exhaustion to a profound degree.

CHLORALISM.

The chloral habit is far less common than the other drug habits thus far considered. Like morphinism it frequently owes its inception to a prescription by a physician for some transient disorder, the patient renewing the prescription without the physician's knowledge or consent. Little by little the patient becomes accustomed to its use and soon cannot sleep without it. It is a poison which is depressing to the heart and vasomotor apparatus. Dyspnœa, vertigo, and general sense of weakness are among the symptoms apt to be present. In well-established cases there is marked nervousness, marked insomnia, and a certain degree of mental weakness as manifested by loss of will-power and failure of memory. In some cases an emotional depression is present which sometimes hardly falls short of actual melancholia. The patient is weak, his movements are tremulous, and he frequently complains of palpitation of the heart.

The treatment of chloralism is to be carried out on the lines already indicated. Care should be taken, however, not to withdraw the drug too suddenly, inasmuch as all of the symptoms of its use become rapidly accentuated by sudden withdrawal. In the experience of the writer the chloral habit is more difficult to treat than any other drug habit, inasmuch as the insomnia resulting from its withdrawal is so great that other narcotics, such as trional or sulphonal, must be employed. At times even morphine must be resorted to. The danger is, of course, that the patient may thus acquire a new habit. Occa-

sionally he suffers so severely from the enfeebled action of the heart that it is necessary to prescribe alcohol, and under these circumstances if care be not exercised, the alcoholic habit may be formed. However, the general principles already indicated in the previous sections should be closely followed. Isolation, absolute rest in bed, with massage, bathing, forced feeding, and perhaps the use of electricity should be instituted. The drug should always be withdrawn very gradually, and if possible without the substitution of any other narcotic. Indeed, it may be safely said that any treatment which embodies the substitution of some other narcotic is in danger of failure. Strychnine, atropine, and digitalis should be freely used in order to tone up the weakened heart and vasomotor apparatus. The treatment should never be entered into without a full appreciation of the dangers of withdrawal. The withdrawal should never be begun without full isolation, because, in the writer's experience, the patient is in danger of beginning the free use of alcohol, being driven there by the intense psychical and physical depression.

OTHER DRUG HABITS.

It not infrequently occurs that patients become the victim of narcotic habits other than those already discussed. Sometimes, also, some of the less commonly used narcotics, such as paraldehyde, somnal, or chloralamide are the stimulants to which the patient becomes addicted. One of the worst and most horrible cases of drug habit which it has been the writer's fortune to treat was a case of paraldehyde habit in which the patient took enormous doses of this disgusting narcotic daily. The patient constantly reeked with the unpleasant odor of the drug, while her mucous membranes were ulcerated and her form much emaciated. Occasionally ether and chloroform are used by inebriates. Among the rarer forms of drug habits met with at the present day are the phenacetin and antipyrin habits. These habits, however, are less harmful than those already mentioned and can, as a rule, be more readily treated. General principles, of course, are to be applied to the treatment of a drug habit no matter what its cause. Among these let us re-state—first, the isolation of the patient in such a manner that his access to the drug save as administered by the physician is absolutely cut off; secondly, the employment of such therapeutic measures as will bring the general level of the patient's health up to the normal. The permanence of the result obtained depends in a large degree upon the influence of friends and relatives.

It certainly seems no more than proper that the victim of a con-

firmed toxic habit should be placed under legal restraint, and yet, as our laws are at present constituted, the legal restraint of inebriates is impossible unless the habit has led to actual insanity. Both courts and lawmakers should realize the fact that the confirmed inebriate is thoroughly irresponsible, and is as much in need of the protection of the law as the insane man. Restraint, we should remember, is protection in another form. Let us hope that the day is not far distant when some plan like that of the Austrian *Curatel* will be instituted in this country.

THE DISORDERS OF SLEEP.

By HUGH T. PATRICK, M. D.

The disorders of sleep are to be classed with pain, dropsy, dyspnœa, and other distressing conditions that are simply symptoms of disease; and the rational treatment of these symptoms means the treatment of the underlying malady. But, as continuous pain may exhaust precious vitality and the organism demand relief without reference to the cause; as dropsy may seriously impede respiration or circulation and call for surgical intervention as a purely symptomatic treatment, so disturbances of sleep, although simply indicative of a morbid condition, may be, when prolonged, something more and require treatment as a pathological entity. More than this, the disorders of sleep—in particular the loss of sleep—may be powerfully retroactive, aggravating the original and causative disease. It has been said that "the greatest of all conservative agents is sleep," and it is known that man is able to do without this "sweet restorer" approximately for the same length of time during which he can abstain from food; that is, about three weeks. That the well must sleep to remain well and that the sick must sleep to recover health would seem to be self-evident; but I am not in the least sympathy with such statements as the following from a prominent author: "In my opinion no one cause is so productive of cerebral affections as persistent wakefulness; for not only is the brain prevented from obtaining rest, but it is kept in a state of erethism which, if not relieved, must sooner or later end in organic disease." This may be true as regards isolated cases, but it teaches a bad pathology and encourages irrational and short-sighted treatment. Insomnia is the result, not the cause, of cerebral affections, and it does not give rise to organic disease. It may be the earliest manifestation of otherwise latent brain-disease, and the conscientious physician will search this out and treat it; not attempt to avert some indefinite and vaguely threatened disaster by attacking the insomnia.

Disorders of sleep are pre-eminently derangements for which routine prescribing is to be sedulously avoided. For this reason, although it is the symptoms that claim our attention, it has been thought best to treat of them to the greatest feasible extent under

the head of the different maladies of whose semeiology they make a part. Finding it, however, impossible to adhere strictly to this plan the arrangement followed has been chosen as a compromise, not logical but convenient, and the subject is introduced with a few detached suggestions.

There is no rule regarding the *amount* of sleep required by the normal individual. Following precedent and the results of personal observation I should say that eight hours is a fair average; but there are healthy persons who need only five hours, and others equally vigorous and active who want nine, ten, or even twelve hours of sleep. Women require more than men, and children more than adults. Regarding the requirements of advanced years authorities differ, but those who hold that a hale and hearty old age may be passed on less sleep than is necessary for the aggressive period of life seem to have the facts in their favor. It is said that manual laborers need more sleep than persons engaged in sedentary pursuits, but this can be true only in a general way. Intense mental application should have for counterpoise the recuperation of long hours of sleep. There is no doubt that a man's intellectual efficiency is closely related to his ability to sleep. But the amount of sleep cannot be regulated by a schedule of hours: the requirements of each individual organism must be the sole determining factor, and this is all the more imperative because the quality of sleep is of almost equal importance with its duration. If a person sleep eight hours and awake unrefreshed, there is something the matter, and such a state of affairs should not be allowed to continue. But the converse—or rather the apparent converse—does not hold strictly true, for in this, as in other matters medical, the statement of the patient is not always to be accorded implicit reliance. Some young men think it rather fine to be preternaturally active, to retire exceedingly late, sleep little, and still be efficient during the day. This is not physiological, and they may be regarded as laying up calamity for the future. Corresponding to this, there are foolish young women who have a pride in attending some social function nearly every evening during the season. They are providing hardships and distressing nervousness for after-life. These are indiscretions, not idiosyncrasies, and are for the family physician to prevent. Even apparently well-balanced business and professional men, physicians included, occasionally feel an abnormal gratification in working hard on insufficient sleep. For all such the following hints are considered to be *apropos*.

The tendency to sleep is not to be habitually resisted, much less is it to be overcome by means of tea, coffee, or other stimulants. Affairs of the day should never be carried into the night: utilizing the quiet hour after retiring for the solution of knotty problems can only be

condemned. After a sufficiency of sleep waking naturally follows, and the person who has to be rudely awakened is one who is curtailed in his allowance of slumber. To this rule there are exceptions, the sluggard being still extant, although the genus seems to have comparatively few representatives in this country. For the healthy individual the practice of taking a siesta is scarcely commendable. Nature's sleeping-time is the night, and if adequate sleep be then obtained the day nap is apt to do more harm than good. But for men whose occupation inevitably entails irregular hours, the faculty of sleeping at will is of inestimable value. Nearly every healthy individual can acquire this habit—numerous assertions to the contrary notwithstanding. This oft-affirmed inability, like the incapacity to digest milk, is generally a subjective myth. The word habit implies personal custom, and the faculty in a majority of cases is not acquired without cultivation. The general practitioner, especially, should court this gentle mistress with assiduity, as success may mean added years of health and usefulness. The habit of waking promptly and completely may also be cultivated and is greatly to be desired.

If there be such a thing as *simple insomnia*, it is the insomnia of habit. This may have originated in an adequate cause which has ceased to act, or it may have developed from bad usages in daily living; occasionally it is due to short-sighted or thoughtless training by parents. The subjects of such insomnia seldom attain to the dignity of "cases," and need only a few instructions regarding the formation of a proper sleep habit. A room, cool, quiet, and well ventilated, preferably with a single occupant; a sufficiency of covering, and if necessary a hot-water bottle, to counteract the physiological decline of temperature that occurs during sleep; an evening meal not necessarily light, but easily digested; a tranquil evening; a regular hour for retiring: these belong to the hygiene of slumber.

After *excessive physical exertion* even the most vigorous may be sleepless. For such, a hot bath followed by some hot, light food or hot, mild stimulant will meet every requirement.

DISORDERS OF SLEEP IN NEURASTHENIA AND HYSTERIA.

For the purposes of this article nice nosological distinctions are considered unnecessary, and the above terms are used loosely so as to include what is ordinarily understood by nervousness and the neurotic disposition. Belonging to these diseases or conditions are a host of abnormalities relating to sleep which may arbitrarily be segregated

into insomnia, distressed sleep, disturbances peculiar to the times of falling asleep and awaking, and excessive somnolence. The last is considered under Narcolepsy.

Insomnia.—On the threshold of a consideration of the practical therapeutics of the insomnia of nervous people, one involuntarily recalls the hackneyed recipe for cooking a hare. The first requirement in every case is to determine the presence of insomnia and its extent. For this purpose the statements of the patient are untrustworthy data. The troubled victim perhaps protests that he has not slept a wink for a week, or that he has averaged half an hour a night for months—assertions that shed considerable light on his mental state, but afford no accurate information as to his hours of sleep. Recalling the fact that loss of sleep for three weeks means death, the absurdity of these common and extravagant statements is obvious. Absolute wakefulness is not a common symptom of neurasthenia, and should never be assumed to exist except upon the authority of a second person. If a reliable nurse or member of the household determine the continuous absence of sleep, apprehension should be entertained of grave organic disease or of a psychosis—at least something more serious than neurasthenia or hysteria. In arranging such surveillance, however, it is well to have the patient ignorant of the fact, for it would be pretty certain to make him more wakeful and vitiate the observation.

Having confirmed beyond a peradventure the existence of insomnia, the next step is to ascertain its nature, to discover its proximate and remote causes, as well as to carefully investigate any coexisting disorders which apparently have no connection with the symptom in question: in short, to make an exhaustive clinical examination. The interrogations cannot be too searching, nor can the physical exploration be too thorough. Details relating to the sleep habit must be accurately known. Falling within this category are the sleeping apartment, its occupancy, heating, ventilation, sewage, and tranquillity (or lack of it); the character of the bed and bedding, not ignoring the possible existence of vermin; the hours of retiring and rising; customary and unusual disturbance. Passing now to the day, the habits from rising to retiring next undergo the scrutiny of the medical adviser. Occupation, aims, ambitions, food, drink, exercise, diversions, associations, and particularly the manner of spending the evenings, are reviewed, the possibility of drug-addiction being never forgotten. When private worries or secret passions constitute the foundation of the trouble the physician cannot be too tactful in investigation (and, it may be added, in treatment), but he should not fail to find the *fons et origo* of the mischief. Above all, any rooted trouble, fixed worry, or imperative conception, especially of a hypochondriacal nature,

must be unearthed. For example, the unfortunate subject may be absolutely unable, in the unoccupied moments after retiring, to free himself from the idea that he has cardiac disease, incipient insanity, or that paralysis is impending. Sometimes more trivial subjects as seriously engage his attention. The thought of burglars, a man under the bed, or the possibility of fire; a harassing doubt as to whether doors have been locked, lights extinguished, or other duties properly performed may keep sleep from weary eyes. Some persons are wakeful simply from excessive anxiety to sleep: from a too ardent wooing of the "gentle mistress." They lie awake to watch the approach of slumber.

It seems needless to insist that the state of every organ is to be determined, and that it is not sufficient to know that the patient is struggling with financial difficulties, brooding over domestic infelicity, or suffering from consuming grief. He may in addition have nephritis, valvular disease, or incipient dementia paralytica. That insomnia is an early symptom of many diseases, and may be for some time the sole distressing manifestation, should be notorious.

Putting aside for the present the organic, toxic, and other cases to be considered later, and confining our attention to ordinary nervous sleeplessness, I would again insist that insomnia as an isolated disorder—simple insomnia—is a great rarity. Except occasional instances of habit-insomnia, loss of sleep is only one part of a symptom-complex. It is not rarely the one crying complaint which makes existence a burden, but investigation at once reveals the more or less perfect picture of hysteria or neurasthenia. The treatment of the symptom, then, is naturally the treatment of the neurosis. But here at once a sharp distinction must be drawn between two classes of cases; in my opinion, at least, this distinction should ever be clear in the mind of the physician, although it may be difficult to draw the line in individual instances. On the one hand, there is true nervous exhaustion: the overdrained, overstrained nervous system that needs principally rest and replenishing; the person worn by work and worry, eaten by ambition or passion, prostrated by mental shock, who needs repose, diversion, nutrition. On the other hand, a nervous system, particularly a cerebral centre, naturally imperfect in many respects, ever in a state of unstable equilibrium, easily thrown out of balance, producing effects out of all proportion to cause. This is the individual of neuropathic temperament, the victim of his cerebrum. He may be for years entirely normal and is not unlikely to be brilliant in some respects, but to be possessed of an imperative conception seems to be his fate. He is usually self-centred, hypersensitive, and wanting a perfect co-ordination of mental powers. These persons are nearly all, at one time or another, insomniacs. Some of them are more: they

are truly insomnomaniacs. These are the *zur Krankheit erwählten* of Meynert, the chosen ones of disease, who most severely tax the physician's wisdom and patience. Among them alone is to be found insomnia as a psychotic equivalent—that is, taking the place of an attack of insanity. Here, too, hereditary insomnia must be sought, if it ever exist. I am inclined to think that so-called hereditary insomnia is frequently only habit-insomnia born of a hypersensitive nervous system, and, as is frequently the case with hysteria, fostered by the progenitors who transmitted the neurotic tendency.

Contemplating now these two classes of cases, it is at once apparent that they will need radically diverse treatment. The first calls for the rest cure in the widest sense of the term, and little more. We have to do with a state of nutrition and function which is produced by a sufficient cause, and which, under favorable circumstances, we expect to be temporary. With proper precautions hypnotics and sedatives may be given with a free hand. In the second class we are confronted by a condition which may be, and generally is, as unalterable as the leopard's coat. Above all others these are the cases in which the individual is to be managed, and the disease, or at least the symptoms, neglected. To this class belong the neurasthenics whose trouble was started by a slight cause and continued to grow long after the cause ceased to exist. Such are laborers who have become permanently nervous after over-lifting; such are most of the cases of the so-called traumatic neurosis and post-operative nervous states. Here careful investigation will bring to light a brooding of one kind or another, with the gradual development of a fixed idea that is generally subconscious—a veritable mental possession. These patients are to be vigilantly protected from hypnotics and stimulants. The treatment must be essentially and continuously mental. The mind may be reached from many points, along numerous channels, but the objective point must be ever the same and always in view. Oftentimes these real unfortunates must be trained anew in ways of life and habits of thought. Instead of rest they should be given occupation, and instead of freedom from care gradually increasing responsibility; instead of drugs, personal influence and support. The development of self-discipline, self-control, hope, and confidence should be the constant aim, to the neglect, if need be, of dyspepsia, constipation, vertigo, or insomnia. A wide grasp of the subject, a buoyant courage, a ready tact—these, and not a prolific formulary, make the effective armamentarium.

As the personal equation is so prominent a factor in treatment, the medical interviews should not be too infrequent. The ordinary experience is that after seeing his physician the patient feels relieved and encouraged—as many of them express it, "lighter" in mind and

body. But this exhilaration and improved tone are not enduring, and the patient needs anew his plunge into the fountain of recuperation. Unless the medical adviser can be truly such a fountain he is not the ideal physician. For this reason, more than any other, the practitioner who is really an enthusiastic and persistent electro-therapeutist, hydro-therapeutist or dieto-therapeutist achieves brilliant results with his favorite treatment.

Perhaps the first thing to teach the true neurasthenic and the insomnomaniac alike is that they are not dying from want of sleep. Though the loss of sleep be very considerable, even sufficient to seriously impede recovery, it is well to reassure the patient. He will sleep better for it. The mere knowledge of insomnia and the anxiety it begets prevent sleep. But it is frequently wise to enforce this assurance and demonstrate to the patient that he can sleep by administering for a few days an adequate hypnotic. For this purpose full doses are advised. It is much better to begin with a large amount and diminish it than to give at first small, tentative doses and be forced to increase them. The choice of drug is not of vital importance, but it should be one that has not already been taken and the patient should never know what it is. Personally, I like trional, about 20 grains, taken with some hot liquid three-quarters of an hour before the sleeping-time. If the heart be perfectly competent, a full dose of chloral, or chloral and bromide, is not objectionable. A good plan is to give 30 or 40 grains of bromide three times a day. Sulphonal is not appropriate for this purpose unless it is wished to prolong the effect of the somnifacient into the day. This is at times desirable. Occasionally the true neurasthenic, as well as the neuropathic insomniac, becomes frantic from worry and loss of sleep, and then to keep him for a few days drowsy and quiet is to start him on the way to recovery. To accomplish this sulphonal is well adapted, as it acts slowly and with prolonged effect. A single full dose (20 to 30 grains) with a glass of hot milk, at least two or three hours before bed-time, will often suffice. If not, a less amount (10 to 20 grains) in the morning will complete the effect. But such treatment is always a temporary expedient or an emergency resort. Milder measures alone are to be used continuously.

For the less aggravated cases, the moderate insomnia and slight neurasthenia of students and of professional and business men, simple changes in the habits of life are generally sufficient, provided they are conscientiously adhered to. A material shortening of the hours of work—that is, a definite curtailment for a definite or sufficient time; well-regulated out-door exercise; a cold morning sponge; proper diet; a quiet evening of humdrum conversation or light reading followed by a hot bath and timely retiring, constitute the

leading features of the treatment. In some persons a hot bath causes wakefulness. A cool bath, a brisk walk, exercise with Indian clubs, dumb-bells, or pulley apparatus may then be substituted. Change of climate is desirable, preferably not to an elevated region; but change is more important than altitude. It goes without saying that, as a rule, watering-places and much frequented resorts are to be avoided. For most cases of moderate exhaustion, life in the woods is an ideal treatment, but it will at once occur to every observer that for some neuroties, given to brooding or with a marked hypochondriacal tendency, seclusion may be the worst possible treatment. Cases that require much society, however, with constant diversion are much rarer than is generally supposed. Most of those thought to be such need systematic occupation.

When the loss of sleep is more considerable, the accompanying symptoms more distressing, and the general condition of the patient has suffered, something must be added to the foregoing regimen. Much is to be done, however, before recourse is had to drugs. A full consideration of the broader measures that are useful in the insomnia of nervous people necessarily involves a discussion of the treatment of neurasthenia and hysteria. This is not my province, but a few general directions bearing especially on the symptom under discussion are considered to be in place.

For neuroties who are vigorous in body it is well to prescribe outdoor occupation, or a long rapid walk before bed-time, or even both. When true nervous exhaustion is present, physical fatigue is not to be recommended. For both classes, a reduction of disturbing noises to a minimum is desirable. In this connection the experiment of Strümpell, which has been repeated by others, is more than suggestive. A patient who was completely anæsthetic had lost the use of one eye and one ear. When the good eye was closed and the good ear occluded, that is, when all communication with the external world was cut off, the patient immediately went to sleep. This proceeding may be imitated to a slight degree in the case of hypersensitive persons by the use of antiphones. Of these the device of Rosenbach and that of Scripture are probably the best and simplest. The former consists of a thin tongue of cotton wadding about 6 by 3 cm. smeared with vaseline and rolled into a cylinder, the ends being slightly pinched in the process. This is introduced into the meatus to a depth of 2 or $2\frac{1}{2}$ cm., the protruding end is flattened out in the concha and covered with a layer of vaseline and cotton. The whole is removed in the morning and the meatus wiped out. The second-named author has successfully used plugs of soft sealing-wax (Dennison's American Express, No. 2). After warming the stick over a flame, a bit of sufficient size is pressed off by the thumb and forefinger and inserted warm and

pliable in the external meatus. To make the adaptation more accurate the tragus is pressed over it for a moment, and for comfort the plug is then loosened a little at top and bottom by the index finger.

That the insomniac is to retire and rise at regular hours goes without saying. The proper preparation for sleep has already been alluded to. In some instances the change of the daily rectal evacuation from the morning to the evening is of assistance, the feeling of comfort and slight lassitude that follows defæcation conducing to slumber. In addition to what has been said of the sleeping apartment, I should like to insist upon the general advisability of single rooms and closed doors. More than once, in my experience, has removal of the wife or mother from a common chamber added one to three hours to her sleeping-time. Some neurasthenics and hysterics —generally those with partial or outspoken agoraphobia—cannot endure this nocturnal seclusion; a good many more say they cannot. For these latter a trial or two under the positive command and assurance of the physician will generally demonstrate the feasibility of the plan and materially hasten recovery. For the former, more refractory cases, a system of gradual removal must be followed, but I have never failed to accomplish it and to note the good effect. For the cases in which "imperative thinking" is the immediate obstacle to sleep one of the many monotonous mental pre-occupations may be of use. Thinking continuously of—

> "A flock of sheep that leisurely pass by,
> One after one; the sound of rain and bees,
> Murmuring; the fall of rivers, winds and seas,
> Smooth fields, white sheets of water, and pure skies."

Repeating prayers or poems over and over, the latter in the inverse order of the stanzas; recalling all the points of interest along a familiar journey, or the objects along a drive; reviewing all the characters in one of Dickens' novels or some other lengthy tale: these are a few examples. But this expedient is of little avail in cases other than those mentioned, where one idea or conception constantly obtrudes itself.

As a sleep-producing ally, the value of *hydrotherapy* can scarcely be over-estimated. The theories as to the how and why of its good results in functional nervous disease are exceedingly elusive: the results themselves are sufficiently substantial and cannot be too emphatically insisted upon. Of the different hydriatric procedures none stands *facile princeps*. Even for an individual case the best may have to be determined by trial, and a change from one kind of application to another is often of advantage.

The masterly article by Dr. Simon Baruch in Volume I. of this

SYSTEM cannot be improved upon, and I have no desire to reiterate his valuable words, even in part. Nevertheless, a few direct hints from my own experience may not be entirely superfluous.

For the immediate induction of sleep the warm or hot bath is the most generally useful. The patient should be immersed to the neck, or at least to the axillæ, with a cold cloth or turban about the head, and the duration may be from ten minutes to one hour; the shorter time for prostrated cases, the longer for robust and very restless ones. I like to close the bath with a dash of cold water or a quick rub (ten seconds) with a cold sponge. But some patients are made more wakeful by the hot bath. For these the cool half-bath (see directions by Baruch), a tepid sponge, or warm douche should be tried. Occasionally a nervous, over-active man is wonderfully quieted by a cold sponge, douche, or shower, followed by vigorous rubbing. The wet pack (see article by Baruch) is perhaps quite as efficient a sedative as the hot bath. In states of extreme agitation I think it even more valuable, but for ordinary nervous persons the rather elaborate procedure is sometimes discomposing and defeats the object. The hot abdominal compress has received the highest praise as a somnifacient, as has also Chapman's spinal ice-bag. I have had no personal experience with them, and while not wishing to decry their inherent merit, I am inclined to attribute much of their virtue to the mental impression, exactly as in the case of the midnight placebo presently to be mentioned. In the general physical and mental treatment of the patient I esteem particularly the matutinal cold sponge, cold douche, or sheet rub. The winter season is a contraindication for none of these. The sponge should be brief and followed by vigorous friction, preferably by a second person. For the douche, in the absence of special equipment, a couple of good-sized pitchers may be used and the water poured from a height over the back, chest, extremities, and occasionally on the head also. A more pronounced effect may be attained by alternating hot and cold water. The sheet rub may be used for patients who are physically robust and for those who are so weak that they can scarcely stand while it is given. I prefer to call it a sheet rub rather than dripping sheet, because in my opinion the "rub" is a much more important factor than the "drip." To the directions given by Baruch I would venture to add the following suggestions:

I dispense with the tub of warm water for the patient to stand in, as it is unnecessary and interferes with quick work. The preparations are all made at the bedside or, if need be, in an adjoining bath-room. A pail or small tub half full of water, to which I generally add a handful of salt; a large, strong, dry sheet, gathered up in folds lengthwise, and laid across the back of a chair so that it can be

grasped at one end and spread out between the two hands in a twinkling; a similar sheet, similarly folded, dropped endwise into the pail of water, with the protruding gathered end resting on the edge of the pail or grasped in the left hand of the attendant; a vigorous, intelligent attendant (two are better) with good "wind:" these are the provisions. The patient (quite nude) rises promptly from the warm bed, stands in front of the rubber with his back toward him and the arms flat along the sides. The attendant quickly draws the sheet from the pail through the half-closed right hand, which frees it of superfluous water, grasps the right upper corner with the right hand and with almost one movement draws the two corners apart, so that the sheet hangs a suspended screen between himself and the patient, and throws it around the latter. The lower part of the sheet will not envelop the lower extremities perfectly, so the attendant quickly steps to the side or front of the patient, draws the edges more completely around and gets the upper corner over the shoulder, where a slap will fasten it. He then fleetly rubs the patient all over, attending simultaneously to front and back, or to right and left, with either hand. The wet sheet is then snatched off, the dry one substituted and the rubbing resumed. As soon as dry the patient gets into bed, and the feet are briskly rubbed for a moment with a dry towel.

The whole procedure, except drying the feet, need not occupy more than one minute and a quarter—it must not consume more than two minutes; and if the rubber be not quite out of breath his work has not been properly done. Tepid or even warm water may be used for the first rub, but the temperature is to be lowered day by day until at the end of four to eight days it is quite cool or cold. The patient should *react at once* and feel a warm glow and general sense of comfort and well-being. Any shivering or depression after getting into bed is evidence of a defect in the administration of the treatment.

Among the more recent helps in general treatment kola may find a place. It should not be forgotten for a moment that it is only a temporary prop, not a true constructive, but it may enable the patient to take sufficient exercise and food for reconstruction. For instance, I have several times been able to get a weak and timid woman on to a wheel by means of the drug, when I could not without it. It is a cerebral exhilarant and I am unable to tell how much of its good effect is due to increased courage and confidence.

Passing again to the more direct treatment of insomnia, the timely administration of nourishment may first be mentioned. For many neurasthenics the evening meal seems to be insufficient fuel for the comparatively long interval between this repast and breakfast. A light meal at bed-time is a pleasant and efficient remedy for a large

proportion of these. Any easily digested aliment is appropriate for this purpose; hot milk and dry bread, bouillon and crackers, hot malted milk or malted meat, oyster-broth, raw oysters, koumyss and matzoon may be mentioned. Some of these patients get to sleep with little trouble or with the assistance of one of the aids already noted, but awaken soon after midnight with a feeling of weakness and prostration, sometimes with absolute hunger; and perspiration is not rare. Under these circumstances the light meal is to be taken at this time. At either time the addition of a modicum of some alcoholic will aid in producing the desired effect. Hot milk-punch, beer, porter, mulled wine, hot toddy, a glass of sherry, are all available, but these adjuvants are always to be used with circumspection.

There is quite a different class of poor sleepers who regularly awaken at twelve or one or two o'clock and are then unable to sleep for a longer or shorter time. They are generally the neurotics—the hysterical or habit insomniacs. Each individual has his personal waking-time and observes it with considerable accuracy. To prescribe with minute detail and quiet assurance a placebo to be taken at the moment of waking is an easy means of bringing sleep to many of these patients. But the remedy must be ready at hand and taken promptly. If it be somewhat disagreeable its efficacy is possibly enhanced, and the suggestion of Folsom, a small amount of paraldehyde in chloroform-water, is a good one, or a little volatile oil dropped into hot water and inhaled may be used. I have used a mixture of compounds spirits of ether and tincture of nux vomica with excellent results. In this connection it may not be amiss to recall that deep and rather rapid respiration has of itself a tranquillizing effect, even to the extent of anæsthesia. If necessary, the placebo may be repeated several times in the night, but it must not be overworked. It is not to be supposed that all periodical wakers may be cured by this treatment. There are other causes for this type of insomnia (see toxic cases and malaria), and this type of neurotic patient is affected with other kinds of insomnia.

It may not be entirely gratuitous to suggest that along with other organs the eye should receive adequate attention. That astigmatism, and probably eye-strain from other ocular defects, may cause sleeplessness is beyond doubt. It is equally true that the inability to sleep may be the only, or at least, the most obtrusive derangement due to the eye-trouble, but it is unlikely that such insomnia would occur in a healthy individual. Given a neurasthenic, the disturbing influence of an error of refraction may serve to prevent sleep, just as may the pulse in the ears or some trivial occurrence of the day that normally excites no reaction. The moral is obvious: Correct the ocular abnormity, but do not stop at that.

The proper place of *electricity* in the treatment of insomnia is still undetermined. That it is sometimes of assistance cannot be questioned, but in analyzing this result it seems impossible to tell how much is due to mental impression and how much to the effect of the current itself on the brain tissue. The obscurity of its *modus operandi* is no cause for rejecting it as a therapeutic agent. Of the three currents, the faradic, galvanic, and static, the first is, as a rule, to be rejected. Passage of the galvanic current from the forehead to the nape of the neck, or *vice versâ*, undoubtedly induces drowsiness in some persons, and they sleep the better for it. The electrodes should be very large and easily moulded to the parts, the current turned on and off gradually by means of a suitable rheostat, and its strength should not exceed 15 to 20 milliampères. I am in favor of rather lengthy sittings (ten to twenty minutes), prolonged if possible until there is a distinct feeling of drowsiness. The later in the day the application is made, the better. The static breeze or bath is somewhat more effective as a hypnotic than the galvanic current. It may be used every day for ten minutes, preferably in the afternoon or evening. Care should be taken to avoid the passage of sparks between the electrode and the head of the patient, as they are exceedingly disagreeable and the shock generally neutralizes the good produced by the breeze. The effect of electricity on sleep is largely a matter of experiment in each case, although in neurasthenia and hysteria it is well to assure the patient beforehand of good results; at least, to make a positive statement as to its benign influence in some cases. The writer feels it incumbent upon him to say, however, that careful observation and some few deliberate experiments on patients have forced him to the conclusion that the greater part of the good effect of galvanization of the brain and of the static breeze is due to their psychic effects—to suggestion, if that term be preferred. But, as before stated, that does not in the least militate against their employment if they will close the eyes of a sleep-wanting patient. Rather should it show that the means is always to be supplemented by the conduct of the physician, which need not be that of an unbalanced enthusiast, but such as will aid in tranquillizing and reassuring the sufferer.

At this juncture, perhaps, some mention should be made of the vibrating helmet (*casque vibrant*) of Gilles de la Tourette. It is a metal helmet, easily adjusted to the head, and surmounted by a diminutive electric motor, to which a small eccentric wheel is attached. The motor is run by a suitable battery, and the rapid revolution of the eccentric communicates a not unpleasant vibration to the helmet, and hence to the head. In my hands (and in the hands of others) it has proved to be of some assistance in relieving the distressing head-symptoms of neurasthenia and in promoting sleep.

Hypnotism should not be utterly discarded in the treatment of insomnia. Its field of usefulness is very restricted, but there is occasionally an hysterical patient, sleepless, nervous, agitated, perhaps apprehensive, whose stomach rejects drugs or in whom they act badly, who may be quickly tranquillized and put to sleep by this means. There are others who have already taken hypnotics to excess and cannot, or think they cannot, sleep without them. In these, hypnotism is of occasional assistance in tiding the patient over the difficult passage between abnormal and normal sleep habits. In any event, hypnotism is to be regarded, not as a system of treatment, but as an improvised stepping-stone to better things. It is always to be used simply, in a matter-of-fact way, without any assumption of mystery or peculiar power or personal influence. Employed with these common-sense precautions, I have never known it to do harm. To avoid any possible misapprehension I add, in so many words, my opinion that in scarcely one case of insomnia in a hundred is hypnotic treatment indicated; in the one-hundred-and-first case it may be the remedy *par excellence*.

The use of somnifacient drugs in the treatment of neurasthenia and hysteria is to be broadly condemned. Their employment is sometimes inevitable, but in the following, as well as the preceding, lines it is intended to point out their restrictions fully as definitely as their indications. In the administration of sleep-producing medicines three principles may be assumed as premises:

1. Never to resort to drugs until other measures have failed.

2. Other means having been exhausted, to be satisfied with the least amount of sleep compatible with health.

3. To use the smallest dose of the remedy that will accomplish the object.

Each of these propositions needs some comment and qualification.

In treating the almost absolute insomnia sometimes caused by great mental shock or moral perturbation, especially if it occur, as is apt to be the case, in a person with neuropathic tendency, it is inadvisable to lose time in an essay with milder remedies. Full doses of hypnotics should be given at once to conserve the vitality of the patient and avert possible mental alienation. This is one of the few instances in which insensibility is desired, even if it only remotely approach natural sleep. The best drugs for the purpose are chloral, trional, sulphonal, or, if need be, the hypodermic injection of hydrobromate of hyoscine, $\frac{1}{100}$ of a grain. Sulphonal is well adapted to this purpose, as its action is prolonged through the day. It should always be given with hot milk and never too frequently. If trional or chloral is used, a full dose may be given shortly before bed-time and then supplemented by bromide during the day (20 to 60 grains t. i. d.).

The plan of giving comparatively large doses of hypnotics for a few days in ordinary neurasthenia, hysteria, or hypochondria has been already alluded to.

Insomnia of the puerperium, infection as a cause being excluded, should be treated in the same vigorous manner.

In its practical application, the second proposition involves a knowledge of how much the patient sleeps, and, as before intimated, investigation may show, contrary to his belief, that the hours of slumber are but slightly curtailed. That is, the disorder of sleep is qualitative and not quantitative: a form of disorder that does not come under the head of insomnia and is but little adapted to medicinal treatment. The less drugs are used in such cases the better. Supposing the duration of sleep to be unnaturally short, still, if the patient be reasonably recuperated, if by the general treatment he can be made to gain ground on this presumably insufficient sleep, it is best to let drugs alone. Having been driven to the use of medicines, that the smallest useful amount is to be given would seem to go without saying. But I am perfectly convinced that it is much better in the beginning to boldly give a thoroughly effective dose than to temporize with only partially efficient medication. This applies particularly to the insomnia of neurasthenia and hysteria, in which the psychic element plays such an important part. To administer in these troubles the rather customary 5 grains each of bromide and chloral three times daily would be absurd, if it were nothing more reprehensible.

Approaching now the symptomatic treatment of insomnia, let it be remembered first that, broadly speaking, symptomatic treatment is always a time-serving expedient or a contribution to euthanasia; and second, that there are several kinds of insomnia. It may be added that there is not a single hypnotic that can be for a long time effective, harmless, and without unpleasant by-effects. This implies that when the prolonged administration of hypnotics is unavoidable a frequent change in the remedy is advisable. In every instance in which a single dose is given its administration should be so timed as to aid the organism when it is already moving sleepward.

For the insomnia of a too active mental state—for the man whose thoughts run riot when he wants to sleep, but who is not really nervously prostrated—bromide is probably the best remedy. It should not be given in a single dose at bed-time, but in divided doses (15 to 30 grains each) through the day. The same treatment, modified, is applicable to the occasional patient who must be tided over a few days of great strain or excitement. In such emergency cases the bromide may be supplemented by a dose of kola in the morning and at noon (wine of coca answers the same purpose), and 20 to 30 grains

of chloral or 15 to 20 grains of trional before bed-time. In the insomnia of an overworked brain, in addition to food and stimulants already alluded to, turpentine is often useful.

The habit, psychic, apprehension insomnia of the neuropathic individual is generally much easier to overcome than that of the true neurasthenic. The latter sometimes resists even heroic doses. An alcoholic stimulant or digitalis is then of advantage, combined with trional, sulphonal, paraldehyde, or chloral. Although sleep is easier procured for the neuropath the relief is much less likely to be lasting, and frequent changes and combinations of drugs are necessary. Chloral should be used but little, morphine never. Trional, paraldehyde, sulphonal, chloralose, chloralamid, are probably the best. Small doses of compound spirits of ether and chloroform, to be taken on waking at night, should be mentioned. Any of the drugs enumerated at the close of this section may be tried.

The selection of a remedy should be made somewhat with reference to the time of wakefulness. If the insomnia be distributed at shorter or longer periods throughout the night, a rather mild but continuous action is desirable. For this, bromides through the day, sulphonal two or three hours before bed-time, paraldehyde, trional, or chloral one-half hour before retiring, or chloralose at bed-time, may be used. Should the patient go to sleep with reasonable promptness but waken too early, it will usually be found that the hour of awaking varies but little. Administration of the remedy may be timed accordingly, and for this purpose sulphonal is admirably adapted. Given at bed-time, with an abundance of hot liquid, it begins to act in one and a half to two hours, and its maximum effect is reached in three or four hours. Taken with cold liquid its action is still longer deferred and slower, but less certain. The other hypnotics may be used for this type of insomnia, but the dose must be relatively large. When the difficulty lies in failure to fall asleep on retiring, the hypnotic must be given early: sulphonal four hours, the other drugs one to two hours, before bed-time.

On occasion, any of the following hypnotics may be employed, and it should be remembered that one may be successful when others have failed.

Trional, in doses of 10 to 30 grains, may be repeated every four hours until several doses are taken. Five-grain doses are sometimes effective. It is almost tasteless, not very soluble, not a circulatory or respiratory depressant, and ill effects are quite infrequent. It may, however, cause nausea, vertigo, headache, slight inco-ordination, tinnitus aurium, and unpleasant diaphoresis.

Sulphonal is very sparingly soluble, even in hot fluids, and consequently acts very slowly. It should be administered in or with a

glass of hot milk, which prevents the production of hæmatoporphyrinuria, otherwise sometimes caused by it. On account of its insolubility, prolonged action, and occasional unpleasant effects, frequent doses are to be avoided. Often a single dose every second day is sufficient. An uncomfortable heavy and dull feeling, unsteady gait, nausea or even vomiting, and headache are to be mentioned as possible after-effects.

Chloralamid, in doses of 20 to 50 grains, best given in acid solution, is an excellent soporific. It has the advantage of having a slightly anodyne action, and is thus useful in the late stage of sciatica, neuralgia, muscular rheumatism, etc., when the acute pain has subsided and only a nervous state with some local aching or soreness remains. It is not so reliable in its action as the two preceding drugs.

Paraldehyde, on account of its almost purely hypnotic effect, absence of danger, and minimum ill effects, is a desirable remedy. But the taste is so exceedingly disagreeable and the repulsive odor so clinging that most patients object to its use. It is, besides, an irritant to the respiratory tract. The dose is 20 minims to 1 drachm.

Chloralose is highly praised by those who have used it extensively. The sleep induced seems to be natural, and disagreeable sensations on waking the exception. In a few instances a large dose has caused rather alarming symptoms, the patient apparently going into collapse, but this has proved to be without danger and can be avoided by careful administration of the drug. Three grains may be given as an initial dose, and seven grains should not be exceeded.

Urethan (dose 10 to 20 grains) is a mild hypnotic, devoid of danger, with nothing in particular to commend it except that it may on occasion be used as a change.

Amyl-hydrate: A colorless oily liquid, of which the dose is from 30 minims to 1 drachm; the unpleasant sequelæ are trifling.

Somnal, hypnone, hypnal and chlorobrom have all been very successful in the hands of competent observers. The writer has had no personal experience with them. The first may be given in doses of 1 drachm to 100 grains, but it is apt to aggravate any existing gastric or intestinal trouble. The dose of the second is 1 drachm, and that of hypnal 15 grains. It is said that chlorobrom may be given for months without untoward effects. The dose is 2 drachms, to be gradually reduced or increased as necessity arises.

The Distresses of Sleep.

The disorders described under this title are not peculiar to hysteria and neurasthenia, but they are comparatively frequent as symptoms of these diseases and hence are here grouped together.

Dreams need no particular mention, except that they undoubtedly

do, in exceptional cases, have a very considerable influence in the genesis and perpetuation of nervous states. This is most often demonstrable in cases of traumatic hysteria, or nervousness following a definite mental shock. The same intense dream, repeated over and over, makes an impression that is carried on into the waking state, although this influence may be subconscious—unnoticed by the patient. An interesting peculiarity of these visions, in such cases as are accompanied by hemianæsthesia and unilateral amblyopia, is that the figures and persons of the dream uniformly first appear on the side corresponding to the amblyopic eye, and pass across the visual field to disappear on the other side.

Night-terror is rare in adults. Mild cases are simply accentuated nightmare, with, perhaps, the element of somnambulism added. Typical cases, however, are something more, and seem to constitute a unique central neurosis. The only case that has come under the personal observation of the writer had resisted all manner of symptomatic treatment, but the patient was dissipated and good general measures were impossible. His attacks were nightly, and I took occasion to observe one. Without premonition, he sat up in bed (sometimes he would spring out of bed) with wide-open eyes and the most terror-stricken expression it has ever been my lot to see. At the same time he gripped the bed with both hands and gave utterance to the most piercing shrieks. The whole was unlike anything I have ever seen in an adult, but impressed me as being possibly a form of epilepsy. Bromide, however, gave no relief.

Muscular cramp is not rare in sleep, and, besides neurasthenia and hysteria, has a multi-pathologic basis. Among the causes may be mentioned physical fatigue, the various toxæmias, arterio-sclerosis, gout, rheumatism, diabetes, chronic nephritis, lithæmia, sciatica (especially the neuritic form), varicose veins, and convalescence from acute disease. The treatment must be that of the causative condition: for the neurotic form, full doses of bromide. Immediate relief of the cramp is best obtained by stepping at once on to a piece of cold oil-cloth or sheet-iron.

Nocturnal pruritis may be a very plague. Besides diathetic treatment, chloride of calcium, 20 to 30 grains, well diluted, two or three times a day after meals, should be tried. For nocturnal burning of the feet a rubber bag of ice-water is worthy of trial.

The subject of painful awakening is treated in the following section, although the disturbance is apparently caused, in many instances, by some distressing impression received or developed in sleep. A consideration of night-palsy or night-numbness has also been transferred to that section, although the condition undoubtedly develops before the patient awakes.

Disorders of Sleep peculiar to the Transition State between Waking and Sleeping.

There is a host of nervous disturbances restricted to the time between the waking and sleeping states—the *pre-dormitium* and *post-dormitium* of Weir Mitchell—that belong especially to neurasthenia and hysteria, without being confined to them.

In the quiet moments before sleep comes, many sensations that are imperceptible or easily neglected during the day obtrude themselves on consciousness. Tinnitus aurium and the aural pulse are among the most frequent of these. An intense appreciation of the presence of the extremities or of the internal organs is a daily complaint. Visual sensations that are only an accentuation of the play of colors that any person can see on closing the eyes, annoy other patients. Muscular starts at the moment of dropping off, a sensation as though the head were expanding, a feeling of bodily weight as of lead, or of gaseous lightness, are common. If the last be a little more pronounced the patient feels as if he were floating off into space or as if the bed were sinking from under him. Presenting some analogy to the sudden motor discharges (which may attain to even a violent degree) are what I would call psychic starts. The patient is just losing himself when he suddenly regains vivid consciousness with an impression of impending death or simply an intense feeling of apprehension. A similar disturbance is later described as pertaining to the post-dormitium, while imperative conceptions and fixed ideas as sleep preventives have already been mentioned. Akin to these are presomnic hallucinations, which are not rare, as every healthy adult can probably recall instances in his own experience. They are even said to be, at times, a family trait, but are nevertheless of importance as a possible indication of intoxication by alcohol or tobacco or of an incipient psychosis. These hallucinations are quite distinct from certain sensory discharges or sudden and distressing subjective sensations that have a predilection for the same antedormal state. They appertain most frequently to the auditory sphere, but may relate to any other of the special senses, to several combined, or to none specifically. Two examples will illustrate: A gentleman of twenty-nine, a typical neurasthenic from neuropathic heredity and prolonged worry, was just falling asleep when he was startled by an apparent explosion in his head. He insists that there was a coincident flash of light, and that the explosion was exactly like the discharge of a pistol—and in the head, not near by. The phenomenon frightened him exceedingly; he started up in bed and it was some minutes before he could again compose himself. The attack was not repeated.

A lady of forty years, nervously and physically exhausted by

manifold cares added to a nervous disposition, was seated, preparing for bed, when, so far as her sensation was concerned, she received a crushing blow on the back of the head. With a cry she sank to the floor, did not lose consciousness, but immediately felt a peculiar, subjective vertigo. Her husband picked her up and placed her in bed, where she found that she could lie only on the left side, any attempt to change this position resulting in the indescribable cephalic distress that seemed to be more like vertigo than anything else. About thirty minutes later I found her lying upon the left side, quiet and comfortable, but very apprehensive. She was positive that should she turn over the disagreeable sensation in the head would return. After a few moments, however, she slowly did so without discomfort. A most careful examination failed to reveal any grounds for supposing the presence of an organic lesion. She has since then (seven years) had no return of the violent stroke, but what she now calls the "silent whirr" is very apt to be felt when she is tired out. It will be noticed that the sensory shock, in this instance, did not take place, strictly speaking, in the pre-dormitium, although the subsequent slighter manifestations have been practically confined to that time. As a matter of fact the symptom may occur during the day, though it rarely does so.

Sometimes the sensation is likened to the sound of a gong or the twang of a harp-string, and when the attacks become habitual there is not rarely an aura, in which case the patient may be able to abort the attack by turning over or sitting up as soon as the aura gives him warning. It is characteristic of the somnolent state during which these peculiar symptoms generally arise, that the patients find great difficulty in thus breaking in on the attack and jugulating it. But this ability may be and should be acquired by practice, and the idea should even be cultivated during the day, to make its execution at night the easier, for systematic interruption of the train of symptoms is one of the best cures.

Disturbed awakings are of various kinds. Many poor sleepers, and many nervous or worried persons who sleep well, awake unrefreshed and complain that they are more fatigued than when they retired.

Separate mention should be made of a particularly distressing group of sensations that are felt on waking—and probably cause the cessation of sleep—as they are not infrequently mistaken for an indication of organic disease or of nocturnal epilepsy. The patient regains consciousness rather suddenly, with a sense of oppression and impending danger, accompanied by palpitation, præcordial distress, cold perspiration, and a feeling of trembling which may be local or generalized. One or more of these separate elements may be absent. Patients, as a rule, mention a shaking or quivering, but in my experience inves-

tigation has generally shown the symptom to be purely subjective. This painful waking is apt to occur very early in the morning (two to four o'clock), and it should be said that the patient usually has no knowledge of nightmare or a horrifying dream as producing it, although it is not unlikely that such cause or accompaniment is present. So far as I am able to judge, the symptom is more frequent in neuroses due to injury or shock. For instance, of five recent cases, two were directly referable to fear of hydrophobia, following dog-bite; one followed an operation on the perineum and vagina; one was caused by a street-car accident; and the last, the exception to the rule, occurred in a young married man who worried incessantly because he was out of work and money. Freud has written of these agitated awakings as a part of his "anxiety neurosis," the etiology of which he believes is always to be found in some sexual irregularity, but the symptom certainly is not confined to neuroses of this origin.

Quite a distinct set of symptoms has been variously described as nocturnal hemiplegia, night-numbness, night-palsy, nocturnal monoplegia, and sleep-pain. The character of the trouble is sufficiently well indicated by the titles. The patient awakes to find himself the victim of a tingling and numbness (sometimes rather a pain) associated or not with transient loss of power. As described by Ormerod the disturbance attacks predominantly the upper extremities, affects principally women at the menopause, and in particular needle-women, scrubbers, and others who labor with the hands. This is the common type. The symptom may appear in persons hemiplegic from cerebral apoplexy and be confined to the paralytic side. But apparently vigorous subjects are not exempt, and its distribution is governed by no known rule. A peculiar form is that which affects the legs from the feet to the knees, is not a distinct pain but rather an acute distress, and begets an imperious desire to move and stamp the feet. Although it generally occurs in sleep and may waken the patient several times in the night I have known it to be almost confined to the pre-dormitium.

True night-palsy and night-numbness are important largely on account of their innocuousness. Occurring in the subject of organic hemiplegia, or indeed in any person, they are certain to awaken apprehension of apoplexy or other paralysis, and it is no trifling matter to be able to give assurance of their benign character—unpleasant though they be. But such reassurance should be given only after a positive diagnosis and the careful exclusion of organic disease. The symptom may occur as a prodrome of multiple neuritis, preceding the pain by several days. A verisimilitude of the hemiplegic or monoplegic form may be presented by the sensory type of Jacksonian epilepsy, which consists of transitory numbness, tingling or other paræsthesia, followed or not by weakness of the affected part,

but unaccompanied by spasm. Such attacks of focal epilepsy are due to organic brain-disease, and may, of course, occur at night, but I have never known of a case in which the fits were only nocturnal.

Weir Mitchell relates the instructive case of a physician who, being himself a sufferer from the functional form of nocturnal hemiplegia, confidently assured a patient who came to him with waking numbness that the trouble was nothing serious. The latter, unfortunately, was diabetic and his attacks of paræsthesia were the precursor of gangrene.

Transitory attacks of numbness, with or without weakness, are not infrequently due to degeneration of the arteries of the brain, and are well known as premonitory signs of cerebral thrombosis. I have known night-numbness of the legs to be closely simulated by syphilitic periostitis of both tibiæ, and an uncontrollable restlessness of the lower extremities, manifested especially after retiring, is not so very rare in locomotor ataxia.

The symptomatic treatment of these disorders connected with going to sleep and waking is not very successful. Occasionally hypnotics to enable the patient to sleep promptly and soundly are of some assistance, but the chief reliance must be placed on general treatment. When they are due to the toxæmia of intestinal derangement, lithæmia, gout, alcohol, or tobacco, which is not rarely the case, permanent removal of the intoxicant affords relief.

DISORDERS OF SLEEP IN MENTAL DISEASE.

Among the insane, by far the most important disorder of sleep is the lack of it. The numerous illusions and hallucinations born of sleep and the night, and the delusions to which they give rise, need not be considered here.

Respecting insomnia as a cause of insanity, an opinion has already been expressed. The possibility need not be denied, neither is there any reason why a neurasthenic insomniac may not become insane, but that the insomnia plays an important rôle in the causation is highly improbable. In fact, the majority of such cases will be found to have been examples of psychic alienation from the first, and the caution not to mistake an incipient psychosis for "nervous prostration" cannot be too often repeated. In some instances the insomnolence seems to be the only symptom of note until a sudden tragedy awakens friends and physician to the fact that a grave condition has been overlooked. This is not the place to consider the differential diagnosis between insanity and neurasthenia, but it may not be amiss to say that when

the patient exhibits marked *tedium vitæ*, loss of interest in usually engaging subjects, and lack of affection for beloved relatives, especially if he be non-communicative and courts solitude, melancholia should be strongly suspected. The appearance of any form of delusion, of very extravagant conduct, or of a few unmistakable somatic signs, takes the case at once out of the realm of nervous prostration. Marked insomnia without apparent cause or appearing and disappearing without relation to other symptoms, particularly in a person with an hereditary tendency to insanity, should put the observer on his guard.

The proper treatment of the insomnia of insanity is a vexed question, but it will be conceded at once that in its incipiency it should receive prompt and careful attention. Although, in my opinion, the wakefulness cannot be regarded as preceding the psychosis, but is rather to be considered as an early manifestation of the disease itself, yet the symptomatic treatment of the insomnia may be thoroughly successful because it is, incidentally, the best treatment for the mental state. To illustrate: We eat, symptomatically, to quiet hunger; physiologically, we eat to provide material for bodily repair and growth: we know that this material has been furnished when hunger ceases, when the appetite sleeps. In other words, if, in this early stage, a sufficiency of refreshing sleep may be procured the attack of insanity may be averted or checked in its inception. The best means of attaining this end may require a nice judgment. All of the general aids enumerated as of value in neurasthenia are applicable here. Particularly are a sufficiency of out-door exercise and appropriate food, quiet seclusion, the hot bath and wet pack, to be commended. Of the soporific drugs, trional, sulphonal, chloral, paraldehyde, or one of the others already enumerated may be used—never forgetting that chloral is a cardiac depressant. In incipient or mild melancholia I do not hesitate to give opium, and although the results are not always gratifying I find it one of the best drugs for this disease, and in doses up to 3 grains three times a day have never seen any ill effects from it. It should ordinarily be withdrawn gradually, although in a few instances stopping it abruptly and substituting full doses of bromide, as is done in the Flechsig treatment of epilepsy, has occasioned only good results.

In severer cases of melancholia, in acute mania, the excited stage of general paralysis, and the like, it is difficult to determine to what extent sedatives should be used. There can be no doubt that a few full doses in the beginning sometimes accomplish a great good. For acute mania the hypodermic administration of $\frac{1}{100}$ grain, or even $\frac{1}{50}$ grain, of the hydrobromate of hyoscine is probably the best remedy, but it has a depressing action on the heart. The same may be used in the other psychoses, although it has no special advantage and

sulphonal, trional, paraldehyde, and chloral are better; the bromides, even in drachm doses, have but little effect. Later the dosage should be regulated by its effect. Insensibility is not sleep, and the condition of the patient before and after the action of the soporific should be carefully compared. Sometimes he is better off to lie awake for days together than to take the doses of medicine necessary to force him into unconsciousness. Neither should it be forgotten that even when a sedative drug causes no perceptible impairment of the vitality, no depression of the circulation or respiration, no derangement of digestion, it may still produce considerable mental depression. In spite of the prospect of a good night's rest being shattered the patient will sometimes request that the sleeping-powder be omitted on account of the oppression of the spirits following its use.

The employment of hypnotics in insanity may be broadly summarized as follows: Early in the disease they may be given rather freely, later with caution, and in the last stages they should be entirely withdrawn in favor of more general measures.

DISORDERS OF SLEEP FROM INTOXICATION.

Alcohol and tobacco are the principal intoxicants producing disorders of sleep, although similar derangements may be caused by lead, mercury, bisulphide of carbon, tea, coffee, and the various drug habits. The auto-intoxication of disease is not separately considered.

Loss of sleep, or disturbed sleep, is frequently the first symptom of alcoholism. Terrifying dreams, or hallucinations at the moment of falling asleep, are well known as belonging to the early stage of delirium tremens. Of the fully developed affection, wakefulness is a prominent symptom and as soon as the patient can sleep and eat convalescence may be considered as inaugurated. In cases of only moderate severity, full doses of bromide (30 to 60 grains) with nux vomica, three times daily, may be quite sufficient to induce sleep and avert a serious attack. But even in the mildest cases the state of the heart must be accurately known, as sudden cardiac failure is always possible. The graver the case, the more urgent is the precaution, and no hypnotic is to be employed at the expense of the patient's powers. For this reason large doses of chloral are rarely indicated. Trional, paraldehyde, chloralamid or sulphonal are preferable. Even with these it is often advantageous to combine strychnine, digitalis, or nitro-glycerin. In delirium tremens, as in the severer cases of insanity, it is sometimes wiser to allow the patient to go without sleep than to give him the heroic doses necessary to compel it.

Treatment of the insomnia of chronic alcoholism, unattended by delirium, means the treatment of the vicious habit, but temporary relief is not difficult. Bromide and strychnine three times a day, trional, and sulphonal act well. The addition of capsicum to the hypnotic and to animal food given at bed-time is of advantage. It is well to remember that a gastric mucous membrane coated with viscid secretion and accustomed to the irritation of raw spirits may be only agreeably stimulated by a dose of red pepper that would be instantly rejected by a more sensitive stomach.

Tobacco is not only a frequent cause of insomnia, but is one of the most influential factors in the production of disturbances peculiar to falling asleep and awaking. The insomnia of tobacco (and also that of alcohol) is apt to take the form of early waking, but not quite so early as that of the neurotic individual before described. The latter usually comes on soon after midnight, toxic insomnia about two hours later, although there is nothing absolute about this rule. At any rate, in every case of insomnia, whatever the type, tobacco should be thought of as a possible cause. The treatment is simple and uniformly successful; withdrawal of the cause, full doses of strychnine, and mild hypnotics for a time. Hot toddy at bed-time is an efficient aid, but should be used with care lest one bad habit be substituted for another.

It may be noted that insomnia and other nervous symptoms of an intoxicant may appear only when the individual has interrupted its use because of conscientious scruples or some bodily indisposition, has become neurasthenic from other causes, or has sustained some physical injury from accident or disease. Under these circumstances the toxic agent as an important part of the etiology may be overlooked.

DISORDERS OF SLEEP IN ACUTE DISEASE.

The treatment of insomnia in acute disease must rest upon the principles already indicated. The best treatment of the sleeplessness is always the treatment of the disease. Although sleep is the great restorer, and is to be procured whenever expedient, it is not to be forced upon the patient at the expense of his vitality. In dealing with acute diseases, which are nearly all self-limited, the formation of drug-habits and the acquisition of drug-tolerance are not primary considerations. The question of cardiac and respiratory depression is of vital importance. In the early stage of pneumonia, for instance, when the pulse is strong and the patient vigorous, persistent insomnia may be overcome by venesection or aconite. If preferred, trional,

chloral, or sufficient doses of morphine may be given, all to the permanent benefit of the patient. But in a later stage, when the patient is exhausted, the pulse flagging, and the respiratory centre necessarily kept up to the highest possible activity, a depressant of any kind would mean death. At such a time, chloral and opium are to be classed with venesection and aconite and religiously avoided. Trional, chloralamid and paraldehyde are not so objectionable, but are to be used with extreme caution. Digitalis, strychnine, alcoholic stimulants, are the remedies indicated to induce sleep. For the wakefulness of pleurisy, morphine and aspiration are probably the best remedies.

The insomnia of typhoid fever is deserving of grave consideration, and the medical attendant should always know when and to what extent wakefulness is present. Early in the disease it undermines the vitality and makes the subject less resistant to the later drains of the disease. In the advanced stages it exhausts the patient, and may prevent enough daily recuperation to keep him alive. Incomparably the best treatment, for all stages alike, is hydrotherapy in one of the several forms so well described by Dr. Baruch in Volume I. of this System. But reduction of temperature is not always followed by sleep, and the insomnia then demands symptomatic treatment. During the first week, or before secondary infection, bromide may be given in full doses or, what is better, chloral hydrate, which at this time is not objectionable and is generally effective. Trional, sulphonal, chloralamid, may be tried but are rather uncertain; opium is to be avoided. Later in the disease trional and similar remedies are more reliable than in the beginning, and codeine ($\frac{1}{4}$ to $\frac{1}{2}$ grain) is an excellent hypnotic, but the best of all at this time is opium or morphine, which is sometimes greatly increased in its action by the addition of $\frac{1}{150}$ to $\frac{1}{100}$ grain of hydrobromate of hyoscine. When prostration is very great the free administration of stimulants is of value, and a hypodermic injection of sulphuric ether has been known to procure refreshing sleep when all else failed.

The treatment of insomnia in other acute diseases may be gathered from the following. In articular rheumatism, antipyrin and Dover's powder; in influenza, phenacetin or sulphonal; in the early stages of the exanthemata, antipyretics, trional, or other pure hypnotics, in the late stages $\frac{1}{3}$-grain doses of morphine unless voluntary effort is needed to keep the respiratory tract clear of mucus and saliva; for the vigil of meningitis, cold to the head and morphine, although full doses of trional may suffice. These are additional hints possibly worthy of mention.

Insomnia of the puerperium may be mentioned in this connection. If marked and not due merely to prostration or loss of blood, it is of grave import, as it then indicates either infection or impending puer-

peral insanity—possibly both. When accompanied by a feeling of well-being or exhilaration it is none the less foreboding. Infection having been excluded or properly treated, hypnotics may be administered even in large doses, for a short time. For this purpose sulphonal, trional, chloralamid, or full doses (1 drachm) of bromide may be used, and there are no objections to chloral (20 grains), or even morphine with atropine hypodermically, if necessary. When the wakefulness is due simply to the excitement attending parturition, as is not rarely the case with primiparæ, any mild hypnotic will answer the purpose. For the insomnia of prostration or acute anæmia the frequent administration of liquids, light food, and small quantities of stimulants is indicated. Half a drachm of Hoffman's anodyne in ice-water is an excellent remedy.

For the insomnia of convalescence the treatment is practically the same as that for anæmia and chlorosis: plenty of easily digested, nutritious food, mild alcoholic drinks in moderation, iron, strychnine, quinine, and other tonics are the best remedies. There is no objection to moderate doses of hypnotics if the heart and digestion do not suffer thereby. Trional, sulphonal, urethan, chloralamid, and compound spirits of ether may be mentioned. Ten grains of quinine at bedtime followed by whiskey in hot water is an excellent remedy, or Warburg's tincture may be tried without the whiskey.

DISORDERS OF SLEEP IN CHRONIC DISEASE.

There is scarcely a chronic disease that does not cause disorders of sleep, and in every instance the ideal treatment of the insomnia is the successful treatment of the causative disease. It would, therefore, be utterly futile to attempt a systematic discussion of the subject in this connection, and what follows is to be considered in the light of suggestions only.

Of 273 cases of insomnia in the practice of MacFarlane and two friends, 17, or one in sixteen, were due to "dyspepsia." If all forms of gastro-intestinal disease were taken into consideration this ratio would probably be greatly increased. However that may be, it is certain that insomnia or some other disorder of sleep may be a symptom of every variety of digestive derangement. It is equally true that loss of sleep not infrequently has a reciprocal action for evil on the digestive function, and that if the patient can be made to sleep, or taught to sleep, the trouble in the gastro-intestinal tract at once improves. There seems to be no doubt that protracted insomnia may be caused by indigestion without other signs of a deranged stomach.

Some of the cases of apparently simple sleeplessness are, I am convinced, due to intestinal auto-intoxication, while others have a twofold etiology—reflex disturbance from the stomach with the toxæmia added. Besides loss of sleep, abnormal somnolence, nightmare, muscular starts, and painful awakings are at times referable to disordered gastro-intestinal functions.

Regulation of the diet, particularly a light, easily digested evening meal, intestinal antisepsis, and good personal hygiene will generally overcome the difficulty. When there is undoubted irritation of the gastric mucous membrane, cocaine may be given for temporary relief. Not infrequently mild hypnotics may be required to break up the vicious sleep-habit.

Lithæmia, chronic rheumatism, and gout are prolific causes of sleep-disorders. The first especially is of importance, as it is so frequently unrecognized, and insomnia or any one of the other forms of disturbed sleep described under Neurasthenia and Hysteria may be the only symptom to which the patient calls the physician's attention. Even the ordinary gastric trouble and headache may be wanting. The wakefulness of lithæmia, like that of other toxæmias, affects especially the early morning hours. When the patient wakes at this time, a drachm each of Carlsbad salts and syrup of ginger in water will often produce immediate sleep. Dependence must be placed, however, on more general treatment. Restriction of meat and fats, with abundance of physical exercise, Turkish baths, mercurial and saline purges, enter into the accepted routine. Salicylate of sodium and muriate of ammonium are to be highly commended. When there is increased arterial tension potassium iodide, alkalies, and aconite are advisable. Lithæmia and gout play an important rôle in the "night-numbness" already described, and some cases are entirely cured by the measures just indicated.

It were unnecessary to say that manifold disorders of sleep may be caused by Bright's disease and diabetes, if they did not occasionally constitute the only notable symptom and thus mislead the diagnostician. The possibility of such an oversight needs but to be mentioned to be avoided. For the insomnia of chronic nephritis chloral is particularly good, as it causes dilatation of the vessels and so lowers arterial tension. Its action is enhanced by the addition of bromide and morphine. In the renal disease of the aged, nothing controls the insomnia so well as opium.

The first statement to be made in any consideration of the disorders of sleep due to disease of the circulatory system is that such disorders are never to be referred to "anæmia of the brain" and "congestion of the brain" in the sense in which these terms are most frequently used. That is, they are not due to changes in the cerebral circulation

as an essential condition—as a morbid entity. The insomnia following severe hæmorrhage is dependent on cerebral anæmia as a part of the general condition. The nightmare of mitral disease may be due to the overfilling of the cerebral veins, but this is not the supposititious condition usually indicated by the term "cerebral congestion." Above all, disorders of sleep are not caused by "congestion of the base of the brain," for the simple reason that such a condition does not exist, except possibly in the first stage of basilar meningitis.

Some patients are awakened in the night by violent palpitation. This may be purely nervous, caused by a distended stomach, or may depend on organic heart-disease. For all alike, a cold compress or an ice-coil to the præcordium is a good palliative. In some cases of cardiac disease not sufficiently severe to cause insomnia, the patient is troubled with nightmare or terrifying dreams unless a certain posture be maintained.

It is worthy of note that insomnia, with possibly some other nervous symptoms, may be the only manifestation of fatty heart. Ordinarily, however, although the patient may in no way complain of the heart, there is a history of irritable temper, occasional weakness, dizziness on exertion, cold feet, disagreeable dreams, and perhaps nocturnal dyspnœa. For this condition digitalis, strychnine, arsenic, and an occasional dose of morphine are indicated. Chloral is to be shunned as dangerous.

For the insomnia of valvular disease, bromide may be given when there is compensatory hypertrophy. When dilatation has supervened, digitalis and similar drugs, diffusible stimulants, nitro-glycerin, nitrite of sodium, etc., must be depended upon. For præcordial distress, the ice-coil or dry cups. In some cases, unloading the circulation by venesection will relieve the heart and allow of refreshing sleep. When the cardiac power is fairly good, opium may be cautiously given and sometimes acts like a charm. If orthopnœa be present, hypnotics are out of the question. In all cases the amount of urea excreted should be estimated; if found deficient, free purgation may at once relieve the insomnia.

Insomnia and other disorders of sleep in chronic respiratory affections are due to cough, passive congestion, fever, or the accompanying anæmia and digestive disturbance. The treatment must be directed accordingly. Occasionally, purely symptomatic therapy must be added and then trional seems to answer the purpose remarkably well. It may be necessary to give codeine or small doses of morphine. The hectic fever of phthisis may often keep the patient awake, and then antipyrin or other antipyretic will hasten the sleep that comes with the morning defervescence. In old cases of emphysema, when there is considerable venous stasis, the treatment should be that of the in-

somnia of heart-disease: semi-recumbent position, heart-tonics, and stimulants. In the chronic pulmonary affections of old people, opium, cautiously used, is the best remedy.

It needs simply to be mentioned that malaria may cause wakefulness without chills or fever, or after these more violent manifestations have been subdued. This seems to apply particularly to children. Such insomnia is very apt to pertain to the early morning hours, like that of the other intoxications. The treatment, of course, embraces quinine and arsenic.

Diseases of the nervous system, organic and functional, cause, in the majority of cases, some disorder of sleep, but these symptoms scarcely merit extended consideration in this connection.

It is worthy of note, however, that the insomnia and other sleep-abnormalities of the aged are generally due to changes in the cerebral arteries and consequently in the nutrition of the brain. Sometimes there is increased somnolence instead of wakefulness. These disorders are frequent after cerebral hæmorrhage or thrombosis, and indeed are not rarely premonitory of such a lesion. The best treatment is the administration of light food (koumyss and matzoon are excellent) with a mild alcoholic stimulant, preferably hot, at bed-time. Digitalis and strychnine given through the day may be added.

Insomnia is not infrequently one of the early symptoms of organic brain-disease, as tumor, abscess, meningitis. To the same category probably belongs the insomnia of syphilis that is unaccompanied by pain or any other evidence of brain disease. Such cases occur, but it is reasonable to suppose that the brain is affected, either by a toxic agent or through alterations in the vessels. That gross brain-syphilis may cause insomnia as well as somnolence is well known, and the cure by active treatment is always prompt.

In paralysis agitans patients often complain bitterly of inability to fall asleep on account of muscular unrest, which I think is a part of the ever-present muscular rigidity of this disease. They cannot assume a comfortable position and are absolutely unable to procure that relaxation and bodily repose necessary to slumber. Duboisine is probably the best remedy for this, but like hyoscine, which is also useful, loses its efficacy after a time. Rather prolonged hot baths at bed-time, the hot pack, massage, trional, paraldehyde, and sulphonal are worthy of trial. Strong faradism, sufficiently vigorous to cause tetanization of the muscles, is at times a great relief, and the short relaxation, or feeling of relaxation, following the treatment may enable the patient to fall asleep.

The subjects of exophthalmic goitre are often kept awake by tachycardia, the violence of the cardiac impulse, and throbbing arteries. For this difficulty 20 to 30 drops of laudanum in some

demulcent, by the rectum, is the surest remedy, but, unfortunately, it cannot be employed often for fear of engendering an appetite for the drug.

DISORDERS OF SLEEP IN INFANCY AND CHILDHOOD.

The healthy new-born babe sleeps constantly, except when taking nourishment. At six months, the child should sleep fifteen hours; at one year, twelve hours; from one to four, ten hours; and up to the eleventh or twelfth year, at least nine hours. At the time of puberty both sexes should have an abundance of sleep, as it is a critical period, the time to avert functional nervous trouble, especially migraine, and to fix a good sleep-habit. It is a solemn duty of the physician to caution parents against giving children too little sleep. Many persons, regarding the number of hours of sleep as a mere matter of habit and of no particular importance, allow children to retire late, and then, for convenience or on principle, get them up early in the morning. The habit of going to sleep readily, sleeping sufficiently, and waking promptly should be, and can be, early inculcated. Children need a good deal of wholesome letting alone.

Persistent insomnia in infancy and childhood is rare, and should at once awaken suspicion of acute infectious disease or some cerebral affection. Restless and broken sleep is common as a result of vicious education or of disease. There are, however, some perfectly healthy children who exhibit great bodily unrest in sleep. Rickets is a frequent cause of insomnia in children, as is also congenital syphilis—even when other signs of the disease are slight or wanting. Any disturbance of the gastro-intestinal tract, from thrush to ascarides of the rectum, may cause disordered sleep, and it should not be forgotten that infants are not rarely kept awake simply by hunger and thirst. Not only must the quantity of milk (or its substitute) be adequate, but the quality must be sufficiently good.

For the wakefulness of the acute fevers nothing compares with the free use of cold water externally and internally, although in the early stages trional and in the late stages alcohol are of distinct advantage.

Night-terror—*pavor nocturnus*—is almost confined to childhood and constitutes a reasonably distinct neurosis. Some attacks are doubtless simply examples of nightmare caused by errors in diet, and others approximate mild somnambulism with visions of people and objects. Still others are to be classed as juvenile hysteria. Adenoid vegetations are responsible for a considerable number of nocturnal nervous attacks in children. But beside all these there

remains a tolerably definite paroxysm still to be accounted for. This comes on ordinarily an hour or two after the child has fallen asleep—suddenly, in the midst of quiet slumber—and occurs but once in the same night. The little patient has the eyes wide open, screams with terror, evidently has visual hallucinations of a frightful character, and does not recognize persons, although he will often cling to them in his fright. The attack is generally of very short duration, but the child may be nervous and timid for some time afterward. The more the disturbance varies from this type, the more likely is it due to some reflex or ascertainable cause, although no sharp line can be drawn either through the character of the attacks or their etiology. Still a distinction should be made, for night-terror due to an overloaded stomach, a fright, or adenoids in the naso-pharynx is a much less serious affair than the same affection dependent upon a defective brain—the neuropathic constitution. This latter class seems to approach dangerously near to epilepsy.

The appropriate treatment is almost indicated by what has just been said. Every possible source of reflex excitation is to be sought out and removed. Rickets especially is to be carefully excluded, or, if found, properly treated. The evening meal is to be light, and all unnatural excitement, startling tales, and disciplinary threats rigorously avoided. These details having been attended to, should the attacks continue, and particularly should the patient have slight dizzy attacks or brief "absences" during the day, vigorous measures are to be adopted. The case is then to be treated as one of incipient epilepsy and the convulsive habit forestalled at once, if possible. Expense, convenience, and (in older children) school education are not to be considered. An absolutely perfect mental and physical hygiene is to be insisted upon, and, in addition, adequate doses of sedatives are to be administered. Bromide, alone or in combination with conium, belladonna, or cannabis indica, is probably the best, although sometimes full doses of trional and sulphonal for a short period will break up the habit. In a very refractory case I should not hesitate to use the Flechsig treatment of epilepsy.

I might add that occasionally a strong mental suggestion by means of a sharp physical impression (the parental hand to the buttocks, a cold douche—or the threat of it) has served to cure the disorder; but such means are generally futile.

The best remedies for nocturnal enuresis are almost complete abstinence from liquids after four or five o'clock, elevation of the foot of the bed, the cold spinal douche at bed-time, belladonna, and rhus aromatica. It may be necessary to systematically waken the child an hour or two after the beginning of sleep, so that he may evacuate the bladder. It should not be forgotten that the trouble

may be due to some removable condition, as to acid urine, vesical calculus, an abnormal prepuce, rectal irritation, etc., or to an abnormally small bladder. In a great many cases nocturnal incontinence is a stigma of neurotic degeneracy.

The insomnia of chorea is controlled by chloral or trional, and children can take relatively large doses of either drug. For that rare affection, nocturnal chorea, that is, chorea confined to sleeping or early waking hours, the same treatment is applicable. Full doses of arsenic should also be given.

NARCOLEPSY.

Recurrent attacks of irresistible sleep are not considered to constitute a disease *per se*, but to be always a symptom of some disease or abnormal condition. In the great majority of cases the attacks are due to either hysteria or epilepsy, but they may be caused by diabetes, chronic nephritis, disease of the heart, liver, or stomach, obesity, pregnancy, anæmia, or organic disease of the brain. Although the affection is but a symptom, it may be practically the only symptom of the causative disease and thus assume the appearance of an essential malady—as Gélineau and others have thought it to be. The frequency and duration of the sleeping-spells vary exceedingly. They may occur at long intervals or many times in a day, and last from a few seconds to several hours. The intensity or profundity of the sleep is also variable. Some patients awaken, if disturbed, as from a natural sleep; others cannot be awakened at all.

Treatment is reasonably successful if directed to the cure of the disease that causes the narcolepsy. Symptomatic treatment, on the other hand, by the administration of caffeine, theine, or alcohol, and by forcing the patient into violent exercise at the onset, has always been most disappointing.

THERAPEUTICS OF RENAL DISEASES.

By NATHAN S. DAVIS, Jr., A. M., M. D.

During the last five years no new methods of treatment have been devised for the relief of renal affections, and no new drugs of importance have been added to the list of those previously used. Something has been contributed to our knowledge of the mode of action of drugs in these maladies. The questions which have elicited most prolonged debate during this time have been the utility of a *milk diet* and the *diuretic powers of calomel*. Eminent clinicians have shown that a mixed diet will in some cases give as good results as the exclusive use of milk. All agree that when milk alone is tolerated by patients it has great advantages over mixed diet or over milk and farinaceous foods. The discussion has, however, led the profession to fear albuminous foods less and to rely more upon a clean alimentary tract and upon the prevention of intestinal fermentation. What of knowledge has been contributed to renal therapeutics can be best set forth in a general consideration of the action of drugs upon this class of diseases.

By medical and hygienic treatment we attempt to correct disturbances of function. It is, therefore, natural in introducing the subject of renal therapeutics to inquire, first, What are the functions of the kidney? and, second, How are they disturbed by the processes which we call disease?

It is the purpose of the kidney to remove any excess of water that may be in the blood and to excrete with it certain of the waste products of tissue-change. The first of these is accomplished chiefly by filtration through the capillaries within the epithelium which lines the glomeruli; the second is accomplished by the epithelium of the convoluted tubules, because of the peculiar selective and excretory powers of its cells. It is probable that some of the salts of the blood, such for instance as sodium chloride, escape with the water through the glomeruli, but the nitrogenous excreta undoubtedly escape through the cells of the convoluted tubules. It is also probable that some of the fluid which escapes through the glomeruli is absorbed again, as it passes from the convoluted tubules into the loop of Henle and the straight tubes. Possibly other substances are also thus re-absorbed; but whatever reabsorption occurs in man is trifling.

These functions of eliminating water and organic and inorganic salts in solution in it may be disturbed so that each is increased, diminished, or suppressed, or new, abnormal substances may make their appearance in it. Some of these changes may be due to modification of function which is not associated with change of structure, but more frequently change of structure develops coincidently with change of function or precedes the latter.

Changes in the quantity of urine or of its normal constituents often occur without structural lesions in the kidneys, but such abnormal ingredients as albumin, blood, and tube-casts only appear when well-marked anatomical changes have developed.

The quantity of urine may be increased because all the functions of the kidney are augmented, or because water only is escaping from the blood more rapidly than is usual. In diabetes mellitus the entire kidney is functionally unusually active, for both an abnormally large quantity of urine is eliminated, and an unusual quantity of the salts ordinarily excreted by these organs. The percentage of sugar present increases the specific gravity of the urine only triflingly as compared with its total increase in this disease. Its greater weight is chiefly due to an excessive elimination of urea and other salts. The presence of an excess of sugar in the urine provokes the unusual diuresis, but the rapid bodily waste and therefore the excessive tissue-change throughout the body gives the kidneys an unusual amount of eliminative work.

In diabetes insipidus or essential polyuria it is the glomeruli which are put to excessive use, and there continuously filters from them more fluid than is normal, but as no unusual supply of eliminable material is brought to the cells of the convoluted tubules the urine is relatively light in weight, or, in other words, its percentage of salts is low.

POLYURIA.

Polyuria is due to a variety of causes, some of which are temporary in action and therefore produce no effects requiring treatment. This is true of the excessive urination which is provoked by copious drinking. Large quantities of pure water may produce such polyuria, but oftener it is large quantities of milk, beer, or beverages strongly charged with carbonic acid gas, which are more powerfully diuretic, that provoke the unusual flow of urine. An excess of sugar, or urea, or both, in the blood will cause polyuria. This can be corrected only by preventing the excessive production of these substances in the body. A modification of diet, such for instance as abstinence

from sugar and starches in the one case, and from albuminoids in the other, may effect the object. But oftener the presence of these substances in the blood in unusually large amounts is due to faults in the functional activity of the pancreas, liver, or tissues generally. Such polyuria does not demand medication addressed to the kidneys. Excessive urination may result from diseases of the nervous system. A centre has been demonstrated in the medulla which at least in part controls the activity of the kidneys. Structural diseases of the brain, medulla, and upper cord have been associated with excessive urination, and with its suppression. A frequently recurring symptom in the functional nervous diseases epilepsy and hysteria is polyuria. Many times it follows an epileptic paroxysm, and quite as often occurs with or during the subsidence of hysterical excitement. In these diseases, also, no medication is required for so transitory a condition.

The polyuria which accompanies renal diseases, notably amyloid kidney and interstitial nephritis, is protective and is to be encouraged, not checked. In these maladies a diminished excretion of nitrogenous waste, which may endanger life, is apt to occur because of the destruction of renal epithelium which characterizes them. If the quantity of urine can be kept large, though its specific gravity may be low, danger to life is lessened. The only form of polyuria which demands treatment is the essential form often called diabetes insipidus.

Diabetes insipidus is characterized by the elimination of an excess of urine, as much as 25 to 50 pints per diem in some instances. The urine is pale, limpid, of low specific gravity, 1001 to 1005. The total of the solids in it is small, although sometimes the quantity of urea is relatively large. Abnormal ingredients are rarely found in the urine in this disease. An excessive thirst accompanies the polyuria. The tongue is usually dry. Appetite may vary, but is generally good. Loss of flesh is not uniformly present, for patients afflicted with the malady may maintain good body-weight. An appearance of good health exists, but usually malaise and lessened endurance are noticeable. The skin is apt to be dry, possibly because of excessive elimination of fluid by the kidneys. This malady may last for years. Death usually results from some superimposed disease. Spontaneous cures have been observed.

No anatomical changes are characteristic of essential polyuria. Even its exact nature is unknown. Its peculiar symptom is probably due to changed blood-pressure within the renal vessels produced through the agency of the vasomotor nerves.

The conditions under which it is likely to arise can rarely be modified favorably.

It occurs at all ages, but oftenest in those who are young, and in males. It has been known to be congenital. It not infrequently recurs in the same family in different generations.

Although by no means constantly associated with structural changes in the central nervous system, or with sudden mental shock, it frequently is. Traumata have apparently provoked this syndrome, as have tumors of the brain and lesions of the medulla. Paralysis of the sixth pair of nerves has so often been associated with diabetes insipidus as to attract the attention of clinicians. Sunstroke, violent excitement, great emotion, have been regarded as conditions essential to its production in some instances. It has followed the drinking of excessively large quantities of cold water, and of cold beer and other alcoholics.

When this malady is treated, the quantity of fluid ingested must first be regulated. It must be lessened gradually to a normal amount, about three pints. Especially should very cold beverages be avoided, and milk, beer, cider, and other alcoholics, as they are diuretics. Watermelon and grapes should be eaten sparingly, if at all. The free use of sugar and very amylaceous food is not permissible. Emotional excitement and both mental and physical fatigue must be avoided. Exercise, however, that is regular and moderate in amount is commendable. An abundance of rest and sleep is desirable. Assistance can be obtained by provoking the vicarious elimination of fluids from the lungs, skin, and intestines. Respiratory exercise, especially in a dry climate, will accomplish this. A residence in a dry and attenuated air will readily quadruple the elimination of fluid by the lungs and skin. Altitudes of from 4000 to 6000 feet in Colorado, New Mexico, and Arizona are especially adapted to these cases. At lower altitudes, and in moist climates, breathing exercise, hot-air and hot-water baths, dry friction of the skin, and warm clothing will aid in effecting an amelioration. Rarely pilocarpine or jaborandi have been resorted to. The provocation of free catharsis by drastics, salines, or calomel will also do good.

As is true of most diseases that are particularly persistent, a great many remedies have been recommended for this one, none of which are uniformly useful. Because of the persistency of the malady and its uncontrollability by medicines, physicians feel the need of many things to which to resort. In each case which I have had to treat I have found my former experience of little value. The class of drugs most uniformly beneficial is that which acts upon the nervous system. Valerian in large doses is one of the best. Castor, musk, asafœtida, camphor, and belladonna have also been used. They are most useful in cases following strong emotion and great excitement. Opium, as is well known, lowers arterial tension, and to a marked extent diminishes

the formation of urine; this drug and its derivatives morphine and codeine are among the best remedies for this malady. The bromides have also been employed, but are much less uniformly efficacious. Nux vomica has apparently done good. The benefit obtained from it, from belladonna, ergot, and astringents is due to the contraction of renal arteries or afferent branches to the glomeruli, and consequently a diminished supply of blood to the glomeruli. But unfortunately these drugs have no selective affinity for the kidneys. They commonly contract all blood-vessels simultaneously and increase arterial tension generally. Whenever this is effected increased diuresis rather than lessened is the result. The perchloride of iron, the acetate of lead, and tannic and gallic acids have been administered internally, hoping that their astringent properties would lessen the flow of urine. Antipyrin, phenacetin, acetanilide, and salicylates have been used because of their analgesic properties.[1] It is, however, more probable that their diaphoretic properties are their valuable ones in this malady. Balsamic preparations have also been lauded, such as copaiba, turpentine, and balsam of tolu. They are, on theoretic grounds, contraindicated, for they produce active congestion of the renal vessels which provokes diuresis. A diminution of urine can only be effected by them when they are used in dangerously large doses, which produce inflammation of the kidneys or a degree of congestion which closely borders upon it.

The continuous electric current has sometimes been employed with apparent benefit. It has been passed from the lumbar to the cervical region along the spine. In those cases complicated by anæmia and debility, iron, quinine, and reconstructives are needed. The iodides and arsenic are frequently employed, although no good reason can be given for their use.

DIMINISHED URINATION.

As the water of urine and the salts which it contains are, for the most part, excreted through different structures, the ratio between them, day by day, may vary greatly. The excretion of fluid depends upon difference of pressure in the vessels of the glomeruli and in the renal tubules, while the excretion of urea and other so-called solids depends upon the vital activity of the cells lining the convoluted tubules. Although these structures may act independently, and commonly do when the kidney is healthy, the function of both is, in disease, usually lessened simultaneously. A moderately copious flow of

[1] A. Duchamp, *Traité de Thérapeutique appliquée*, fasc. ii. p. 133.

urine is essential for the removal of all the solids that need elimination. Therefore a partial suppression of solid excreta occurs whenever the quantity of water eliminated is much diminished. If the kidneys fail to perform their functions death occurs. It is not produced suddenly. Several hours are necessary for its accomplishment. It is due to intoxication by substances which accumulate in the blood and nervous tissues when they are not eliminated by the kidneys. This intoxication is gradually developed, for time is necessary to accumulate the poisonous excreta to a fatal dose.

Complete and Partial Anuria.—All degrees of *lessened renal activity* may be observed, from complete suppression to a very slight diminution of the quantity of urine. To have the glomeruli inactive is of little import, and is always a transitory phenomenon, unless the function of the other renal structures is simultaneously modified. It is, however, important to know how the function of the glomeruli can be increased, for it often must be, in order to carry an excess of fluid away from some part of the human body.

The quantity of urine is lessened when the blood-pressure in the renal vessels is low and when the renal tubules are obstructed. These changes may be effected by a variety of morbid conditions, which it is the duty of the therapeutist to remove or modify. The blood-pressure is low whenever the heart is feeble; whenever dilatation takes place in large vascular areas, as, for instance, in the intestines; and whenever contraction of the renal artery or vessels afferent to glomeruli occurs. These latter changes almost never occur, for the morbid states which cause contraction of renal vessels cause contraction extensively in other than the renal vessels, and therefore raise blood-pressure and provoke diuresis.

It is conceivable that the splanchnics may be excited by neighboring inflammation or by pressure of tumors or contracting tissues, and thus provoke contraction of renal vessels. Such lesions are so much more apt to destroy these nerves that the opposite result, dilatation of renal vessels, is the rule. Dilatation in large vascular areas, as in the skin or intestines, occurs sometimes in the former from exposure to heat, in both from sudden congestion due to the application of irritants which may ultimately produce inflammation. It may be caused by some medicines, as by those which provoke intestinal congestion, or by paralysis due to injury of the medulla, spine, or splanchnics.

Whenever inflammation occurs in a kidney the function of the organ is modified by both vascular and tubular changes. The current in the inflamed capillary tuft is slow. The glomerulus is filled with serum in which a few corpuscles float. The difference of pressure within the capillaries and outside them is slight, therefore diuresis is

lessened. At the same time many of the renal tubules are obstructed by casts, loosened epithelium, and granular matter, the result of disintegration of cells. Other tubules are lessened in calibre by the swelling of epithelial cells lining them, and by congestion and œdema of the surrounding interstitial tissues. All of these changes tend to lessen diuresis. When the epithelium has been extensively loosened and lost, and the tubules enlarged in calibre, the flow of urine is augmented unless vascular changes prevent it.

Another factor entering into the complex process of inflammation that tends to lessen the flow of urine is inflammatory œdema. It causes fluid to find its way into the tubules in considerable quantity through the interstices of the epithelium, and helps to fill the tubules, increases the pressure of fluid in them, and therefore lessens filtration through the glomeruli. When cirrhosis develops in kidneys diuresis is increased, for only small areas are involved in inflammation at one time, and in the other comparatively healthy parts blood-pressure is raised, as it is in the arteries of the body generally. Therefore, although little by little the renal tissues may be extensively destroyed, the healthy portion excretes an unusual quantity of fluid so long as the heart retains its strength and maintains high arterial tension.

When there is general œdema, not infrequently the kidneys become dropsical. The flow of urine from them is then greatly lessened, both because of pressure of the distended interstitial tissue upon the tubules and because of the partial filling of the tubules from the lymph-spaces, as just explained in inflammatory œdema.

Passive congestion of the kidneys, due to cardiac or pulmonary diseases, or to pressure upon the renal veins by tumors or cicatricial tissue, is a common cause of diminished diuresis. When this lesion is fully developed, the secretion of urine is lessened, as it is in nephritis. Congestion of the tissue about the tubules tends to narrow them; the cells lining them swell and lessen their calibre still more; often casts and loosened cells fill and obstruct them. Transudation of serum from the surrounding capillaries into the tubules fills them and lessens the difference of pressure within them and the glomerular vessels, which also checks diuresis. Œdema is commonly associated with passive hyperæmia of the kidneys.

Another occasional cause of diminished flow of urine is the presence of an obstruction in the ureters. This may be a stone, compression by cicatricial tissue outside of them, or pressure of tumors or misplaced organs upon them. When the kidneys themselves are movable a kink or sharp bend may partly or completely obstruct the ureters.

Sudden and complete suppression of urine may be due to embolism of both renal arteries; an accident of most infrequent occurrence.

Suppression of the function of the kidneys produces an accumulation of waste products in the blood which are abnormal in considerable amount, and some of which are extremely poisonous to the central nervous system. These substances are primarily produced in the cells of the various tissues of the body, or are absorbed in the alimentary tract from foods that are eaten, or are products of fermentation in the contents of the intestines. Salts of potassium are absorbed in large amounts, and become poisonous when they accumulate in the blood. Various nitrogenous substances, which are always present in the blood in moderate quantity, are toxic when accumulated there in considerable amounts. They are derived in part from nitrogenous food and in part from waste of tissues. Some of these latter substances require modification by the liver that they may be made eliminable in the urine or in the bile. The liver should prevent most of the products of intestinal fermentation from entering the general circulation. Unfortunately, in many of the diseases in which the kidneys are inactive the liver is so also, and therefore the opportunity for the accumulation of toxic matter in the blood is increased.

URÆMIA.

The most striking symptoms of renal insufficiency grow out of the effect of retained poisons upon the nervous system. A diminished excretion of urine, or of urinary solids, generally escapes attention until striking nervous manifestations develop. If the onset of renal insufficiency is sudden or rapid, the symptoms of acute poisoning, *acute uræmia*, are displayed. If, as happens quite as often, the insufficiency is of slow and gradual development, the nervous system becomes in part habituated to or tolerant of the poisons, and the symptoms are those of *chronic uræmia*.

Convulsions or coma, or both together, characterize acute uræmia. These symptoms may develop suddenly without premonition, or they may be preceded by some of the phenomena of chronic uræmia. Convulsions rarely occur without coma, although the latter is sometimes not deep. Coma without convulsions is of much more frequent occurrence. In most cases stupor or unconsciousness exists in the intervals of quiet between successive convulsions. The latter also vary much in severity. They may be limited to slight twitching or may be violent generalized movements. Death occurs especially when the convulsions are violent because they interfere with respiration. Coma may be deep from the start, but oftener begins with drowsiness and deepens into stupor and unconsciousness. The pulse and temper-

ature are commonly unchanged. When convulsions are violent the temperature sometimes rises temporarily. The pupils may be large, small, or normal.

Symptoms of chronic uræmia are manifold. They often consist in periodical headaches; in anorexia, or nausea and vomiting, or diarrhœa; in respiratory disturbances, such as asthma and Cheyne-Stokes respiration; in sudden temporary blindness or deafness; in formications and numbness; rarely in delirium either maniacal or muttering. At times in the breath of patients and in exhalations from their bodies a urinous odor is detectable. In uræmia the quantity of nitrogenous matter voided by the kidneys in twenty-four hours is always lessened, although its percentage in samples may be high at certain times in the day. Usually the total quantity of urine voided is diminished, but in chronic interstitial nephritis it may exceed a normal average, although the excretion of waste is diminished. In treating uræmia it must be constantly remembered that the condition of the kidneys alone rarely produces the intoxication, but simultaneous derangement of the liver and unwholesome fermentation of the contents of the alimentary tract helps to cause it.

In order to avert suppression of urine either partial or complete its causes must be borne in mind. The conditions which lead to the anatomical changes provocative of renal insufficiency must be removed. As renal congestion and inflammation are especially apt to occur in infectious diseases they must in such cases be averted. Preventive measures consist in protecting the skin against sudden chilling by woollen garments and warm clothing. Attention must be directed to this especially during convalescence from infectious diseases. In the period of fever exposure is rarely harmful, but during convalescence, when the body is weak and reaction to cold takes place slowly, congestion and acute inflammation of the kidneys are common. In order that the chemical changes of nutrition may be as perfect as possible, and waste products as thoroughly eliminated by the lungs as they can be, it is best that the patient's room be kept cool and the air in it fresh. During convalescence from those diseases which are oftenest complicated by nephritis and uræmia, patients should be kept unusually long in bed and in one room. It is quite as essential that the skin be kept clean as that the lungs should be filled with fresh air. Frequent bathing is therefore necessary. The mouth and other cavities of the body should also be cleansed in order that toxic matter may not be absorbed from them. The bowels must be emptied regularly and freely. Foods which easily ferment must be avoided, as well as those which are rich in potassium salts and extractives. Alcoholics should be forbidden because they are irritating to the urinary channels and because they interfere with normal tissue-

change. Water should be taken copiously. If uræmia threatens or exists in a mild form, abstinence from food for a few hours, or even one or two days, the use of water freely, and a prompt, copious purge will often cause all traces of the malady to disappear.

Whenever albumin is present in the urine and uræmia is evident or justly to be feared, food, if it must be taken, should consist exclusively of milk. It is best because it leaves in the intestines a residue that is only slightly toxic and little liable to become so. It is also a diuretic of the first order, promoting greater activity both of renal epithelium and glomeruli. So long as uræmic symptoms exist other albuminous foods should not be taken. If uræmia has subsided, meat, fish, and eggs ought not to be eaten for some days—not until a copious excretion of urine of fairly normal character has been well established. A milk diet is not well tolerated by many patients, and cannot be rigidly adhered to. It can be varied by the use of farinaceous foods and fruit. But even when such articles are permitted, milk should form the chief ingredient of the diet.

I have so frequently seen complete abstinence from food, with copious bowel movements, relieve mild uræmia that I can strongly recommend such practice if patients are sufficiently vigorous to bear starvation for a time. Within a few weeks I have seen two patients undoubtedly relieved of uræmia in this manner. One, a woman, was in the midst of maniacal uræmia. The mental cloud disappeared in forty-eight hours upon a water diet and pills of elaterium. The second was in great distress because of Cheyne–Stokes respiration, anorexia, and vomiting. Other modes of treatment—mild cathartics, diuretics, and diaphoretics—were tried with little avail. When even a milk diet was stopped, and freer catharsis provoked by salines, improvement soon began. All gastric and respiratory discomfort were for the time relieved.

In those diseases liable to complication by renal insufficiency, chemical antipyretics should be avoided, for even more than alcohol do they interfere with proper tissue-change. They destroy the oxygen-carrying power of blood in proportion to their efficiency as prompt febrifuges. Cold baths are not, however, contraindicated in the same way. Febrile diseases treated by them are found to be infrequently complicated by renal disorders. They provoke healthier tissue-change, stimulate circulation, promote diuresis, and under their influence the urine becomes more nearly normal.

When uræmia exists, complete rest should be enjoined, but when it is feared rather than present, gentle exercise is to be commended, for it promotes more perfect metabolism and helps to eliminate from the tissues the products of their own waste which are often toxic to them. Massage and passive movements must sometimes be prescribed

for those who are too feeble to take active exercise. But exercise should never be exhausting or very fatiguing.

If renal congestion causes either acute or chronic uræmia it should be lessened by (*a*) bleeding whenever the patient is strong. More of poisonous matter can be rapidly removed from the blood by this than by any other means. If blood is abstracted by leeches placed on the loin between the lowermost ribs and the crest of the ilium, and between the outer edge of the oblique muscles of the abdomen and latissimus dorsi, congestion of the kidney can be directly influenced, as in this area the superficial vessels anastomose with the renal. If, however, uræmia is mild one may safely trust to (*b*) depletion by the intestines, and to (*c*) cardiac tonics which can relieve renal congestion by promoting a more vigorous circulation and higher general blood-pressure.

When nephritis exists an attempt must be made to keep the renal tubules permeable.

The stomach and intestines must be kept clean and fermentation in them must be lessened. The dietetic regimen already described will help to accomplish this. Gastric and intestinal antiseptics must be used with caution, for most of them are eliminated by the kidneys, and are more or less irritating to them. This is especially true of carbolic acid, resorcin, and naphthol. The preparations of bismuth are the least harmful, especially the subgallate and subnitrate. Bouchard has strongly recommended large doses of charcoal to absorb or modify and to prevent absorption of many of the toxic compounds produced within the alimentary tract by fermentation. Cathartics are essential to cleanse these organs. Salines usually are sufficient. They should be given in concentrated form when the stomach is empty, and no fluid should be taken until after they have moved the bowels, if it is desired to deplete the kidneys and to promote vicarious elimination of waste matter from the blood. Calomel is also a useful purge. It is at the same time an intestinal antiseptic and diuretic of value. It cannot be used day after day, for it will produce salivation and may even irritate the inflamed kidneys. It is rather to be resorted to from time to time. If one aims to promote vicarious elimination as well as to cleanse the bowel, the best results are obtainable from elaterium and similar drastics. They soon produce intestinal distress and must be discontinued. They can be employed most advantageously during the first day or two of severe uræmia. If it is relieved the bowel can be kept clean and more moderate depletion maintained by salines.

Vicarious elimination by the skin is quite as essential as by the intestines. To promote as vigorous action of it as possible, heat should be applied to it. Patients having chronic uræmia who are still fairly strong generally prefer a hot bath. They should be completely

immersed in water as hot as can be borne and should be kept in the tub fifteen or twenty minutes. When they leave the water they should be rapidly dried, briskly rubbed, and put at once to bed under woollen blankets and warm comforters, in order to maintain diaphoresis for some time longer. Such baths may be repeated daily, or at longer intervals, as seems needful. If a patient is comatose or too feeble to be taken from bed a hot-air bath in bed is best. If, before heat is applied, the skin is briskly rubbed for a few minutes sweating is provoked more quickly. The patient should be covered with the warmest bedding and under it hot air from an oil lamp beside the bed should be conducted by a section of bent stove-pipe. Copious sweating can be thus provoked with ease, and can be maintained for a half-hour or more as seems best.

Pilocarpine, when administered hypodermically or internally, will also produce free diaphoresis, but it so often produces distressing salivation and cardiac weakness that it is rarely used except in extremely urgent cases and when the heart is strong. Recently its employment endermically has been commended. Five centigrammes mixed with one hundred grammes of lanolin or vaseline, rubbed thoroughly over the body and legs will cause copious sweating, especially if the patient is immediately wrapped in wool. The pilocarpine acts directly upon the glands of the skin. None seems to be absorbed, and consequently no bad effects are produced by it when used endermically. This method of administering pilocarpine I have tried and have found it successful.

The skin should be kept in an active state and clean even if actual sweating is not deemed necessary. Gentle rubbing and warm or plunge or sponge baths will accomplish this. They can be used daily or nearly so with advantage.

One other drug is employed with the hope that it will modify any abnormal metabolism that may exist. I refer to oxygen. I have never been able to convince myself that its inhalation did good unless respiration was impeded. Theoretically, if the bronchial tubes and lungs are unobstructed, we can expect the blood to take up no more oxygen when it is inhaled pure than when it is diluted as it is in air. If, however, breathing is difficult and the blood must be oxygenated in a small portion of the lungs only, pure oxygen will contribute greatly to the comfort and well-being of the sufferer. It is of utility when Cheyne-Stokes respiration is distressing, and of still more assistance if there is uræmic asthma or pulmonary œdema.

Uræmic disturbances of respiration often form indications for special treatment. Cheyne-Stokes respiration, which is observable frequently in uræmia, is best relieved by the general treatment already outlined. Its intensity can often be lessened, and therefore

the weariness and distress which it causes be mitigated, by full doses of bromide of sodium, chloral, or opium. The first two are to be preferred. The latter is to be avoided if possible, because it lessens diuresis, dries the skin, and diminishes the functional activity of most glands. These drugs produce their good effects by benumbing the central nervous system and making it less susceptible to the poison of uræmia. They are also useful when asthma is a uræmic phenomenon. The nitrites can be employed both in asthma and Cheyne-Stokes respiration. They undoubtedly act chiefly upon the motor nerves, and especially upon their termini in muscles. By lessening the irritability of these structures the muscles are less liable to be thrown into spasm or their rhythmical action to be modified. Dilatation of the vessels of the medulla plays a part in effecting the relief which these drugs afford to Cheyne-Stokes respiration. Nitrite of sodium and nitro-glycerin are to be preferred, for their effects are more persistent than those of nitrite of amyl: 1 to 3 grains of the first can be used, and from $\frac{1}{200}$ to $\frac{1}{50}$ of the second. These doses can be repeated hourly for a few times if necessary, but generally need not be employed more than three or four times daily.

Anorexia and vomiting are not infrequent uræmic symptoms. Both are best relieved by the treatment already outlined for uræmia. Whenever the patient's strength will permit, abstinence from food, the ingestion of an abundance of water, and free catharsis give quicker relief than can be obtained by any other mode of treatment. Cleanliness of the alimentary canal is of importance in all uræmias, but of the greatest in those cases in which gastric symptoms predominate. As abstinence from food can only be maintained for a few hours, diet is all-important. Milk, or, if it be vomited in large curds, a modified milk made of cream and milk-sugar with a small proportion of skim-milk and enough lime-water to make it slightly alkaline, may be used advantageously. It is best given in small quantities, one or two tablespoonfuls, every hour at first. So soon as it is demonstrated that the stomach will tolerate it the quantity should be increased. If possible, a strict milk diet should be adhered to. If this is impossible, gruels may be substituted. The diet must be the same as for uræmia, but food must be more carefully administered. Such anti-emetics as carbolic acid, resorcin, and sulphocarbolate of zinc are contraindicated because they are irritating to the kidneys and may increase the renal inflammation. Indeed, if used, they seem to produce little effect. Cerium oxalate and preparations of bismuth can be employed without danger, but in vomiting of uræmic origin they do little good. Opiates will often lessen the irritability of the stomach. I have seen this illustrated very recently in two cases. An attempt was at first made to relieve persistent vomiting by the com-

mon treatment of uræmia. Anti-emetics were employed unavailingly, but 10-drop doses of paregoric, repeated hourly three or four times, gave relief in one case; a single dose of morphine, $\frac{1}{8}$ of a grain, gave relief in the other. Unfortunately, opiates lessen the excretion of urine and increase the danger of profound uræmia. They must therefore be used with caution and only temporarily.

Not infrequently persistent diarrhœa is a uræmic symptom. If it is not too severe and exhausting, it is rather a benefit than a detriment to the patient. It is probably a spontaneous attempt at vicarious elimination of uræmic poisons. It, however, often becomes exhausting and must be controlled. If opiates are employed at all in such cases they must be used with caution. Whenever it is possible the enteritis should be controlled by astringents only.

Maniacal uræmia rarely requires special treatment. Deep congestion of the meninges has been found in most fatal cases of this kind. It is probable that the brain-symptoms are in part the result of it. Bleeding does good by withdrawing both poison from the system and blood from the brain. The meningeal congestion is perhaps most certainly relieved by leeches applied behind the ears. Veratrum and aconite also help it by relaxing the peripheral arterioles.

NEPHROLITHIASIS.

Although the kidneys are competent, not infrequently certain ingredients of the urine are eliminated in abnormally large quantities, leading to their deposition in solid crystalline forms either in the substance or the pelvis of these organs. Stone in the kidney or *nephrolithiasis* is also due sometimes to decomposition of urine in the kidney-pelvis. Two large groups of cases of stone are recognizable: one in which the stone forms in acid urine; the other in which it forms in alkaline. The former includes the uric acid and oxalic acid calculi; the latter the phosphatic. Calculi are not infrequently of mixed structure. A tendency to form both uric acid and oxalic acid calculi may exist simultaneously. A calculus made of either of these substances may excite pyelitis, which in turn will produce alkaline urine by provoking fermentation in it, and then phosphates may be deposited as a layer upon the original stone, or form new ones. Phosphatic calculi within the kidneys are always preceded by and associated with catarrh of the pelvis.

The symptoms of stone are in mild cases aching in the back or loins, usually upon one side only, especially when patients stand long or are much jolted. An excess of mucus and some pus can often be found

in the urine. Hæmaturia is not infrequent, especially when stones are composed of oxalic or uric acid. Stones may lie in the pelvis of a kidney or remain partly imbedded in its substance indefinitely without producing symptoms. When stones are passed from the kidneys renal colic is provoked. Very fine renal sand can be voided without pain, but it oftener produces discomfort and sometimes colic. The pain of renal colic is first felt in the loin, later diagonally across the lower part of the abdomen toward the bladder. At the same time lancinating pain will often strike the testicle on the affected side. An inclination to urinate with frequency is the rule. When stones are large colic is apt to be severe. Its location is that of the milder pain, but when intense it can be located with difficulty, for it seems to be diffuse. The symptoms of collapse may develop in cases of intense pain. Nausea and vomiting are common even in milder ones. A diagnosis of the kind of stone that produces a colic can only be made by examination of it.

Uric acid calculi are due to uricacidæmia—that is, a dyscrasic state or constitutional fault characterized by an excess of uric acid in the blood. Or, they may be due to great acidity of the urine, which is commonly caused by an excess of acid phosphates. An excess of the latter is due to a fault in nutrition, the exact nature of which is unknown. Individuals who are liable to uricacidæmia are also liable to excrete unusually acid urine. The two conditions which lead to uric acid lithiasis are therefore apt to exist together. The free use of nitrogenous food tends both to increase the formation of uric acid and to make the urine acid.

These facts give us a key to prophylactic treatment for those who have uric acid calculi. Albuminous foods should be permitted only in small amounts. The least objectionable are chicken, fish, oysters, and eggs. It is best to advise that meats be eaten very sparingly. On the other hand, a vegetable diet if adhered to too strictly may increase an existing tendency to the formation of oxalic calculi. Patients should be instructed to drink copiously pure water in order to increase the quantity of urine and to wash as much of saline matter as possible from the blood, thus preventing its lodgment in the urinary passages. Alcoholic drinks should be interdicted, for they lessen oxidation of waste products and are irritants to the urinary channels. Moderate exercise can be encouraged, for it promotes more complete and perfect metabolism, and whenever that exists waste products are most certain to be transformed into as eliminable a form as possible. Violent exercise will produce an excess of waste and overtax the organs of elimination. By friction of the skin and warm baths its excretory power can be encouraged. Derangement of the stomach and bowels is a common cause of uricacidæmia and

oxalicacidæmia. Such conditions should be corrected and their return prevented.

Medicinal treatment consists mainly in making the urine alkaline and keeping it mildly so, in making with uric acid soluble compounds, and lastly in provoking freer diuresis. Bicarbonate of sodium or potassium is often prescribed as an antacid in doses of from two to four grains daily. The carbonate, citrate, and benzoate of lithium are also favorite remedies. They not only make the urine alkaline, but are supposed to form lithium urate, which is a readily soluble salt. The daily dose of these is from 40 to 60 grains. The benzoates (of sodium, potassium, or lithium) have the added advantage that they form with uric acid soluble hippurates. While these reactions with uric acid are easily demonstrable in the laboratory it has been denied that they occur in the human organism. In the stomach lithia meets phosphates and triple phosphates, forming with them nearly insoluble compounds which prevent its reaching the uric acid of the blood and tissues. Moreover, Haig claims that by depriving the blood of part of the phosphate of soda which it normally contains, and which it gets from the alimentary tract, the excretion of uric acid is actually lessened instead of increased. The phosphates form soluble combinations with uric acid and aid its elimination. In spite of these contradictory views lithia is generally conceded by clinicians to do good. The best results, however, are usually obtained from very dilute solutions such as natural lithia waters. The diuresis produced by the imbibition of large quantities of fluid is probably the chief cause of good results when these waters are employed.

Piperazin is a drug which has been used for a comparatively short time. It is certainly efficacious. It increases the oxidation of excrementitious matter and makes uric acid soluble. It may therefore lessen its formation, and certainly aids its elimination. Although when stones of moderate size exist they cannot be dissolved by any agent as yet known to us, uric acid sand may be, and I believe the sharp corners of even larger stones can be smoothed. One of my patients who was long under treatment passed uric acid gravel often, and passed smooth stones whenever piperazin was used for some time, and angular, acicular stones when it was not employed. The daily dose of this drug is about 45 grains.

To lessen the concentration of urine it is all-important to increase diuresis. Alkalies will help to promote it, but reliance must chiefly be placed upon water and milk. Patients should be encouraged to use them freely. Diuretics, irritating and congesting the kidneys, should not be used.

When calculi are composed of oxalic acid it is essential that the usual atonic condition of the intestinal tract which provokes flatulence

and constipation be corrected. Foods which contain oxalates must be forbidden; the commonest of which are rhubarb, sorrel, tomatoes, tea, spinach, cabbage, and celery. Alkalies are useless as solvents. A variety of acids have been employed with the hope that they would dissolve the oxalates, but they have proved worthless. Diuretics do good, but they must be employed with caution, for at times they provoke the passage of calculi and precipitate renal colic or hæmaturia. They do good by washing the oxalates from the system before they can be deposited in the tissues.

When calculi are phosphatic, the amount of vegetable food eaten should be restricted so that the urine will not become unnecessarily alkaline. Such acids as nitric and citric, and such drugs as acid sodium phosphate, have been used to make the urine acid and to prevent its decomposition and the precipitation of phosphates. The results have not been satisfactory. In this form of lithiasis, as in the others, diuretics are of prime importance, and none are better than water and milk. As phosphatic stones in the kidney are always associated with catarrhal inflammation of its pelvis, this lesion must be combated.

Water or milk to be efficacious as a diuretic must be used in considerable quantities. Often patients are unaccustomed to drink much of either. For such it is best to prescribe water in gradually increasing amounts, at first three or four glasses daily, and an increase of one glass every one or two days until four to six pints are taken each twenty-four hours.

Mineral waters are used extensively in Europe to combat renal lithiasis. The waters in this country often employed with benefit are the almost pure waters, those unusually free from mineral matter, such as the Waukesha waters, and lithia waters such as the Londonderry, Buffalo, and Geneva lithia. It is probable that they do good because they are taken in quantities which make them diuretic. The Kissingen, Vichy, and Geyser springs of Saratoga (New York), and those of Vichy, Vals, Contrexeville, and Kissingen in Europe, are especially good for patients who are strong and dyspeptic. They are rather contraindicated for those who are anæmic, weak, or neurasthenic. The West Baden spring of Indiana, the Congress and Hathorn of Saratoga, and the Carlsbad of Austria, are useful for the same class of patients, and are especially good for those who are stout. The mineral matter in these waters stimulates better oxidation of waste and helps to correct digestive and intestinal disorders. The West Baden and Carlsbad waters are decidedly laxative as well as diuretic. Those first named only stimulate metabolism and provoke diuresis. When there is pyelitis, sulphur waters often prove beneficial, such as can be obtained from White Sulphur Springs (Virginia) and Richfield

Springs (New York). Hydrotherapy is contraindicated when there is a strong tendency to renal hæmorrhage; when the bladder is either very irritable or paralytic; when there is hydronephrosis, interstitial nephritis, or simple polyuria. Undoubtedly much of the benefit obtained by patients when they visit mineral springs is derived from change of climate, scene, mode of life, and freedom from care.

Frequently before prophylactic or curative treatment can be instituted renal colic in mild or severe form must be combated. I have seen mild attacks recurring every few weeks for two or three years stopped by a single catheterization of the affected kidney, and the removal of a drachm or thereabouts of uric acid sand. If the pain, which accompanies the passage of renal gravel, is slight or moderate, complete rest, counter-irritants over the kidneys, hot baths and diuretics may suffice. Morphine and belladonna administered by the mouth are usually needed to relieve renal colic. When vomiting occurs medicine cannot be given *per os*, but must be administered hypodermically or *per rectum*.

Whenever colic is severe the prime indication for treatment is to relieve pain, and a secondary one is to hasten the expulsion of the stone. So violent is the pain, and oftentimes so excited is the patient, that anæsthesia must be produced by chloroform or ether. If the pain is thus allayed temporarily, an enema of chloral or a hypodermic of morphine can be given to prolong the relief. It is usually impossible to give drugs by the mouth under these circumstances, for vomiting is frequent. Much care must be taken not to administer morphine and chloral in doses that are too large or to give them too frequently in large doses; for while the pain lasts safe quantities sometimes seem useless, but if they are given in unduly large amounts, when the pain suddenly ceases (as it often does) symptoms of poisoning develop. It is best to help out these drugs by inhalation of chloroform and ether. They not only relieve pain but relax the muscular spasm. Belladonna and stramonium are often used as adjuvants. They paralyze unstriped muscle-fibres such as partly form the wall of the ureters. They therefore help to relieve the colic which spasm of the ureters produces. Unfortunately, unless used in almost toxic doses they will not accomplish this. Atropine is, however, commonly combined with morphine when it is administered for renal colic. Unless a patient is anæsthetized or narcotized rest cannot be maintained provided the colic is severe. Copious draughts of water are desirable to help provoke a rapid expulsion of a stone, but often they cannot be taken because of vomiting.

HÆMOGLOBINURIA AND HÆMATURIA.

By *hæmoglobinuria* is meant the occurrence of hæmoglobin in urine in a state of solution. It gives to the latter a characteristic blood- or brownish-red color. By *hæmaturia* is meant the occurrence of red blood-corpuscles in sufficient numbers to give it a blood-color. We are now interested only in hæmaturia of renal origin. It may be due to injuries, to crushing, to a fall, or to blows upon the back or sides. It occurs in many renal disorders, in congestion of the kidneys, acute nephritis, suppurative and tubercular nephritis, renal cancer, embolism, calculi, and hydatids. Calculi and inflammation of the pelvis may also provoke hæmorrhage. It occasionally occurs in abnormal blood-states such as purpura hæmorrhagica, scurvy, and malignant fevers. It is endemic in certain localities within the tropics. Infection by *filaria* or *Bilharzia* is the usual cause in these places. In rare instances hæmaturia occurs vicariously for menstruation.

The first indication for treatment is to remove, whenever possible, the cause of hæmorrhage. Treatment of renal congestion and inflammation is often the whole treatment for individual cases of hæmaturia. When abnormal blood-states are its cause these require treatment. If menstruation is suppressed and hæmaturia is of vicarious origin, the former must, if possible, be re-established. Renal hæmorrhage due to calculus often cannot be checked until the stone is removed from the kidney by an operation. When inflammation of the kidneys, or the pelvis of them, is the cause of hæmaturia the usual antiphlogistic measures must be employed—such as cupping, leeching, rest, and counter-irritants. If inflammation is due to infection, hot baths (temperature 40–42° C.) are among the most useful measures of relief: they should be repeated daily, and sometimes twice daily. The baths are contraindicated if there is great cardiac weakness or arterial sclerosis. Cupping and leeching cannot be used safely if anæmia or cachexia are great, as they often are in cancer, tuberculosis, and grave pyrexias. When hæmaturia is of traumatic origin an ice-bag on the small of the back and loin is especially useful, and in all cases whenever hæmaturia exists complete rest should be prescribed. Of medicines, astringents are most usually resorted to. By constricting the renal capillaries, it is hoped, hæmorrhage will be checked. Those most frequently used are tannic and gallic acids, perchloride of iron, acetate of lead, hamamelis, chimaphila, rhatany, and krameria. The first four are the most reliable; they are administered by the mouth in the usual therapeutic doses. Ergot can be given with benefit in most cases. It is commonly administered by the mouth, but may be given hypodermically when the stomach is disturbed. Its mode of action is too well known to require repetition. In hæmaturia produced by

calculus, oil of sandalwood, copaiba, or turpentine will often check the bleeding when ergot and astringents fail. They are contraindicated when the renal parenchyma is inflamed.

Medicinal treatment for the endemic hæmaturia of hot countries is of little avail. Astringents, ergot, and balsams are employed, but rarely with much success. Parasiticides have proven equally useless. The best results are gotten from change of climate and constructive treatment and medication. A visit to the cooler part of the temperate zone, or, at least, to high altitudes within the tropics, is most certain to help. Hæmatics and stimulants to nutrition, such as iron, arsenic, quinine, and strychnine, are important adjuvants to climatic treatment. During convalescence sea-baths or hydrotherapy at saline and chalybeate springs prove useful. Not infrequently, although recovery is obtained by change of climate the malady will return if the patient again lives in a hot country. Those who must live in infected districts should exercise the utmost care to use only water that has been purified by boiling and filtration, and foods that are in a wholesome condition, well cooked, and prepared with cleanliness. These are most important prophylactic measures. It is also necessary to avoid excessive labor, and if one is debilitated by slight ailments to endeavor quickly to correct them, for debility from any cause predisposes to infection.

The exciting cause of hæmoglobinuria is renal congestion, but it must be associated with an alteration of nutrition which is either hereditary or acquired. The exact nature of this disturbance of nutrition is unknown. In many cases it is produced by syphilis, malaria, rheumatism, anæmia, excessive nitrogenous waste, or excessive elimination of mineral salts by the urine. The commonest cases of renal congestion are undoubtedly exposure to cold, over-exercise, or excess in venery or abuse of alcoholics. It need hardly be said that when any of these conditions are present the first object of treatment must be their removal. The usual treatment applicable to the predisposing maladies must be instituted. If excessive nitrogenous waste is going on, a milk and vegetable diet should be prescribed and albumins should be used sparingly if at all. Any derangement of digestion that may exist should be corrected. Benzoates and salicylates will help to eliminate nitrogenous compounds in forms as little irritating as possible. Gentle exercise must be commended, but excessive exercise must be forbidden. When there is an excessive elimination of mineral salts by the urine, and consequently a diminished amount in the blood, Robin recommends a diet rich in such mineral matter, and the administration of a powder twice daily of the following complex construction :

	Gramme.
Chloride of sodium	0.3
Chloride of potassium	0.26
Phosphate of sodium	0.06
Phosphate of potassium	0.15
Glycerophosphate of lime	0.03
Glycerophosphate of magnesia	0.017
Sulphate of potassium	0.03
Glycerophosphate of iron	0.062
Hæmoglobin (powder)	0.062

When hæmoglobinuria exists or relapses are feared the patient must be protected by warm woollen garments from sudden chilling; the danger from abuse of alcoholics and excess in venery or in exercise must be explained. Complete rest should be prescribed so long as the urine is bloody. During this time a milk diet is to be preferred. As in hæmaturia so in hæmoglobinuria astringents and hæmostatics are often prescribed, but they are of little advantage, for the underlying fault of nutrition is not corrected by them.

Hæmorrhage from the kidneys is rarely fatal. It often produces great prostration, and may be an important factor in producing death. It is usually of short duration, lasting from a few hours to a week or two. In rare instances it persists for many weeks or months. In one case watched by me it lasted nearly two years and was often very considerable in amount. No treatment seemed of advantage. The patient had a similar attack some years before which lasted about six months. Recurrences of hæmoglobinuria are not uncommon. Hæmaturia, unless its cause can be radically removed, is equally liable to return.

ALBUMINURIA.

Albumin is another abnormal product which often appears in urine. Serum-albumin and serum-globulin are the forms of albumin found in albuminuria. They may appear in the urine because of suppuration or hæmorrhage in the bladder or urethra. When they come from the kidneys they enter the urine almost exclusively from the glomeruli. A small amount of albumin may find its way into the tubules through their walls. When there is intense congestion, inflammation, or profound degeneration or destruction of renal epithelium, always the largest amount—and often all that gains access to the tubules—comes from the glomeruli. If the blood contains an excess of albumin, or if, as Rosenbach urges, there is in it a surplus of loosely united albumin, the latter will find its way from the glomeruli into the urine. Oftener structural changes in the Mal-

pighian bodies, the result of congestion, inflammation, or degeneration, are the causes of its appearance there. In health the serum of the blood percolates through the walls of the capillaries into lymph-spaces outside. The albumin in it is prevented from entering the renal tubules by the epithelium which covers the tufts of capillaries and lines each glomerulus. This epithelium permits the water and certain salts to enter the tubules, but retains the albumin. If, however, because of congestion these lymph-spaces are overfilled, or because of structural changes the continuity of the epithelium is broken, albumin will escape. Not very infrequently a trace of albumin appears constantly, or from time to time, in the urine of those who otherwise seem healthy. Sometimes in such cases no casts, renal epithelium, blood, or other evidences of structural disease of the kidneys can be found and upon autopsy no gross lesion can be detected. These are cases of *glomerular insufficiency*. Usually glomerular insufficiency is of a few glomeruli only, not of all or most of them. So slight may the lesion be that the function of the kidneys as organs of elimination is not interfered with, and the loss of albumin is not enough to cause weakness. These are the cases occasionally met with of albuminuria in persons apparently healthy. Renal albuminuria never occurs if the kidneys are perfectly healthy.

The following are some of the conditions under which albuminuria arises: It is rarely hereditary. Mental and physical fatigue will sometimes cause and much oftener aggravate it. Many diseases which disturb general circulation or profoundly change the quality of the blood will provoke it, such as heart diseases, exophthalmic goitre, deep anæmias and cachectic states. Often both cardiac weakness and a perverted blood-state coexist. In febrile diseases the nutrition of the kidneys, and therefore the permeability of the glomeruli, is modified. Sometimes degeneration or inflammation is the cause of albuminuria of fever. Glomerular insufficiency is produced more readily in some persons than in others. Albumin appears in the urine of a few individuals whenever they eat large quantities of albuminous food; in others it will appear only at certain parts of the day. Such cases belong to the category of cyclic or intermittent albuminuria. The former are characterized by the appearance of albumin at a regular time daily, the latter by its irregular recurrence. In such cases albumin usually disappears from the urine at night, but reappears after two or three hours of ordinary and necessary exercise, or irregularly after more violent exercise or injudicious eating. These are forms of albuminuria that do not affect the general health of a patient and seem not to endanger life; they do signify the existence of weak kidneys, the functions of which are easily disturbed. Glomerular insufficiency increases one's liability to inflammation, and patients

with it should be warned of the danger and taught the precautions necessary to its prevention. Lastly, organic disease of the kidneys causes albuminuria. Indeed, so commonly is it the cause that the existence of an organic disease can be taken for granted when there is renal albuminuria, unless it can be demonstrated that no such lesion exists.

These conditions productive of renal albuminuria give a key to its prevention and often to its cure. Some of the conditions provoking it cannot be removed, as, for instance, chronic Bright's disease. But one can guard against mental and physical fatigue and thus often prevent recurrences of albuminuria, or at least lessen its severity. Anæmias and cardiac weakness can frequently be cured, or at least so far mitigated as to stop glomerular insufficiency. In certain of the milder cases albumin can be removed from the urine by a suitable regimen, and in most cases its abundance can be lessened or augmented by changes in diet. That an exclusive milk diet is the best is almost universally admitted. I have already given reasons for its use when there is renal incompetence. When it is the chief article of food albumin in the urine usually lessens and often disappears. Unfortunately milk is not well tolerated by many patients, especially when they have chronic albuminuria, for its use is then indicated over a long period of time. In milder cases a milk diet is unnecessary, especially when there is not acute nephritis, or an acute exacerbation, and when uræmia is not threatening. In general a diet which embraces a pint or more of milk daily, and most vegetables, breads, and fruits, is permissible. A careful study of the relationship of meats and eggs to albuminuria in individual cases will enable a physician to allow many of his patients some of them. What I say now of diet should be considered with what I have said above of the regimen of the uræmic. What I say now does not apply to those threatened with uræmia, but to those having a mild albuminuria which is not associated with renal incompetence. Albuminous foods should not be taken generously at any time. The least harmful are chicken, turkey, bacon, mutton, and lamb. They are to be preferred in the order named. The most objectionable are beef and game. When meat is eaten it should be simply cooked, without gravies. Meats are deleterious apparently in proportion as they are rich in extractives and are slow of disintegration and digestion in the stomach and intestines. It is best to study the effect of different kinds and amounts of meat in each case by itself.

Can eggs be taken without harm? This is a disputed question. Egg-albumin introduced into the blood directly or absorbed from subcutaneous tissues will undoubtedly produce albuminuria in healthy animals. Repeatedly has albumin been found in the urine of men

who have eaten eggs in too large numbers at one time. This albuminuria is probably due in part to an excess of albumin in the blood, and in part to its being there in "loosely united" forms, or forms unnatural to it. On the other hand, of late, and in growing numbers, clinicians claim that eggs are among the articles of food least harmful in albuminuria. Robin[1] strongly recommends them, but urges that they be always cooked. The question of their hurtfulness must be regarded as an open one. I have permitted some patients to eat eggs and have observed no increase of albumin in their urine, but I have seen in others an apparent transient increase. It is true of eggs as of meat that their effect upon albuminuria should be studied in each case.

The physician who expects to see albumin always disappear from the urine, or lessen in it, when a patient is deprived of albuminous food will often be disappointed. Fish is usually classed among the least harmful forms of nitrogenous food. This is commonly true, and is most true of fish which is fresh and the meat of which contains only a small percentage of extractives. Fish easily spoils or undergoes changes that make it less fit for albuminuries than for healthy people to eat. Farinaceous foods are permissible. They embrace breads, potatoes, turnips, beets, rice, farina, cornstarch, etc. Spinach, peas, and beans are unobjectionable. Usually cabbage, lettuce, asparagus, and tomatoes can be taken. Sometimes the last is contraindicated because it contains oxalic acid, and the others because they are rich in potassium salts. Fruits may be permitted and are most welcome to those who must be dieted strictly.

No beverages are so good as pure water (distilled usually to be preferred) and milk. Tea and coffee in very moderate amounts can be permitted in mild cases. Alcoholics, even the mildest and no matter in how small amounts, are contraindicated. They are irritants to the kidneys and aggravate lesions which produce albuminuria. If given to those who have glomerular incompetence they will increase it. Koumyss is contraindicated because of the alcohol it contains. Matzoon can be used as a food, but it is in no sense a substitute for milk in the treatment of these cases. When milk is the only article of diet at least three or four pints should be taken daily.

A number of medicines are employed to lessen the excretion of albumin. As a restricted diet often fails, so do these medicines. The quantity of albumin passed from the kidney is rarely enough in itself to do much harm. It is not necessary in cases of structural disease of the kidney to address medication to the albuminuria *per se*. When albumin is voided in unusually large amount, and when it is voided without apparent renal lesion, it requires treatment. Astringents,

[1] *Traité de Thérapeutique*, 1896, fasc. ii. p. 98.

given by the mouth, have been chiefly relied upon, such as tannic acid, sodium tannate, hydrastin, uva ursi and its active principle arbutin, and chloride of iron. It is supposed that these do good by affecting the capillaries of the glomeruli. Fuchsin in doses of 2 to 4 grains has been used and lauded by many authors. The lactate of strontium was introduced into medicine by Germain Sée for albuminuria. It is given in doses of 15 to 30 grains three or four times daily. It has been claimed to greatly lessen the elimination of albumin by the kidneys. It is chiefly indicated in chronic albuminuria, and should not be used when there is much danger of uræmia or much fever. How either fuchsin or the lactate of strontium do good is not known. All these remedies I have tried most patiently and in all kinds of cases, but so rarely with appreciable results that I am compelled to trust more to regimen than to medication for the relief of albuminuria. Digitalis, strychnine, and ergot have been employed with the hope that their contraction of the minuter blood-vessels might check the escape of albumin. By increasing blood-pressure they often increase diuresis, and therefore lessen the percentage of albumin in the urine. If they are given in full doses they produce albuminuria in health and increase it when there is renal disease. They act just as ligature of a renal artery does. Cantharides and other irritating diuretics have been used in albuminuria. There is, however, so much danger of provoking nephritis or of aggravating it by them that I am unwilling to use or recommend them. The acetate of lead has been employed, but it is also a provoker of nephritis. If used at all it should be only temporarily, and certainly never by individuals who are gouty or have uric acid diathesis. The astringent properties of this drug are those that commend it.

CHYLURIA.

Chyluria is the name given to a passage of milky urine which contains a large amount of emulsified fat. An admixture of blood sometimes gives it a brown instead of yellowish-white color. Its cause is often the same as of hæmaturia, therefore the two are commonly combined, and blood as well as chyle is found in the urine. It is often intermittent, the chyluria occurring only at night or only by day, or recurring for some days, disappearing, and not reappearing for many days. It is a condition rarely met in temperate climates, but is not uncommon in the tropics. It is due to obstruction of the chyle-channels, the formation frequently of lymphangioma, and finally the rupture of these distended lymph-vessels into the bladder, ureter,

or pelvis of the kidney. In the tropics the presence, growth, multiplication, and at times probably death of the *filaria sanguinis hominis* or *Bilharzia hæmatobium* in the chyle-channels is the common cause of their obstruction. In such cases the immature parasites are discoverable in the urine. The natural tendency in many cases for the urine to lose, at least temporarily, its chylous appearance makes it difficult to judge of the success of drugs in relieving it. The treatment that has been tried and the variety of drugs employed are almost the same as for hæmaturia. In the hands of one observer one drug or combination has proved effective in a given case; another observer has had success with another, and a third has tried them all on a case without effect. I will not repeat the long list of those that have been used. The most efficacious are the following: Astringents, especially tannic acid, ergot, and perchloride of iron, either alone or with opium; the iodides and iodine. The latter probably stimulate the circulation of lymph and re-establish its movements in normal channels by removing obstructions in the chyle-ducts or mesenteric and intestinal adenoid bodies. Reconstructive measures form a third useful means of relief. A change of climate is above all things useful when the condition has a parasitic origin. Cold baths and especially sea-baths are often extremely beneficial. As adjuvants to these modes of treatment iron, quinine, and strychnine prove of value. I need not repeat what I have just written, pertinent to hæmaturia of similar parasitic origin, of the uselessness of parasiticides. Against this form of chyluria the same prophylactic measures must be instituted as for the hæmaturia.

PASSIVE RENAL CONGESTION.

Passive congestion of the kidneys is produced usually by uncompensated cardiac disease, less frequently by diseases of the lungs which cause obstruction to pulmonary vessels, and thereby provoke overwork and exhaustion of the heart. Diseases of the liver, such as cirrhosis, which are accompanied by destruction of hepatic vessels may also produce the lesion. In rarer instances compression of the renal veins by tumors, the gravid uterus, or cicatricial tissue, and thrombosis of them, are its cause.

Passive hyperæmia leads to distention of the veins and capillaries between the tubules and in the glomeruli. When congestion is produced rapidly and is considerable, hæmorrhages into the connective tissues and glomeruli are numerous. The tubules are compressed by the dilated vessels which surround them and in part are blocked

by blood-corpuscles which accumulate in them. In such cases the kidneys are rapidly enlarged. When congestion develops slowly hæmorrhages are rare and small, but capillaries are distended and those within the glomeruli are often ruptured, as is the epithelial lining of the Malpighian bodies, which permits the escape of albumin and often of a few blood-corpuscles. From the intertubular capillaries a serous exudation takes place which produces slight dropsy of the connective tissue. The epithelium of the tubules is at first swollen and later usually degenerated by albuminoid or fatty changes in it. When such congestion is of very long standing the interstitial tissues undergo hyperplasia. This begins just beneath the cortex, about the interlobular vessels, and sometimes spreads deeply into the kidney. When it is considerable atrophy appears, or at least loss of function occurs in the many glomeruli and tubules included in the newly forming cirrhotic tissue. Whatever be the degree, acuteness, or chronicity of the lesion, secretion of urine is diminished both by the circulatory changes and by the narrowed calibre of tubules and obstructions to them by such impediments as blood-corpuscles and tube-casts which are formed when the renal epithelium is much diseased. Glomerular insufficiency, which always occurs in a greater or less degree, produces albuminuria and more or less hæmaturia. The urine may be scant and concentrated, a normal excretion of waste taking place, but oftener the renal epithelium is so involved as to be incapable of performing its full excretory function.

When passive congestion exists, the first attempt at treatment should be to remove its cause. This can often be accomplished by treating cardiac asystole. If, however, structural changes in the liver or compression or obstruction to the renal veins are its cause, a removal of it cannot always be effected. Other conditions than cardiac feebleness are important in the production of passive congestion of the kidneys even when heart disease exists. For the congestion comes and goes and again returns, although the strength, size, and other conditions of the heart vary little. Moreover, in a given case, at one time we observe passive congestion of the kidneys, at another of the liver. Something else than cardiac weakness may cause it to appear at one time in one organ and at another in the other. Just what these conditions are, we do not know.

There is not much danger of uræmia unless nephritis is developed upon the passive congestion. When the alimentary canal contains much toxic material, and the liver is not doing its work well, intense passive congestion may cause uræmia. To avert nephritis as well as uræmia, it is best when passive congestion exists to prescribe a milk diet, to cleanse the stomach and intestines by provoking vigorous peristalsis and free catharsis.

It is important that the secretion of urine be made abundant. Three to four litres of milk daily will usually accomplish this. However, it is often necessary to supplement the action of milk. The citrate and acetate of potash and similar salts are extremely useful, especially when tube-casts and blood-corpuscles are numerous in the urine, for by making the urine alkaline they help to prevent the formation of casts, and to carry into solution the detritus of degenerated cells. In this way they make the renal tubules more permeable. They are also especially indicated when the excretion of nitrogenous matter is lessened, for they directly stimulate the renal epithelium. Lactose, as Germain Sée has pointed out, can also be used with advantage, particularly when milk is not well tolerated. It is administered in solution: 100 grains of lactose in 2 litres of water, the whole to be taken in divided doses during twenty-four hours. It is at times found helpful to add to this solution the acetate of potassium. Lactose especially stimulates the function of the glomeruli. Glucose is nearly, if not quite, as efficient as lactose. Calomel is frequently used as a diuretic. It is sometimes given in moderately full doses, two or three grains daily, for one or two days, at intervals of a week; or in chronic cases in small doses, a fraction of a grain two or three times daily, and continued for one or two weeks. When given in large doses it is usually purgative and depleting as well as diuretic. Just how it produces its diuretic effect is not fully demonstrated—probably, as Locke[1] has suggested, it increases the amount of urea in the blood; and no diuretic is more powerful than urea. Furthermore, calomel does good by stimulating the liver which is often functionally inactive when the kidneys are congested, by hastening the evacuation of the upper portion of the intestinal canal, and by acting in it as an antiseptic. Thus it prevents the formation and accumulation of toxic matter, or substances often irritating to the kidneys, in the intestine, and hastens their transformation into inert substances by the liver.

An attempt to lessen the congestion of the renal vessels can often be made with advantage. It is rarely necessary to resort to cupping or leeching the loins unless the congestion is very intense and suddenly developed. But a calomel or saline purge is often of value. Drugs such as digitalis and ergot are given to increase arterial pressure, to thereby force blood through the distended capillaries and veins in more nearly normal quantities. Digitalis is especially indicated when there is cardiac asystole because of its effect on the heart as well as on the blood-vessels. Ergot may be used in the same cases, but seems to be most indicated when passive congestion is due to causes within the abdomen rather than to the heart. Ergot contracts the muscle-fibres in the walls of veins as well as of arteries,

[1] *Practitioner*, xxxvii. p. 170.

and therefore tends by direct action upon the veins to relieve passive congestion.

The iodides of sodium and potassium are employed to favor the flow of lymph from the distended intertubular lymph-spaces. The iodide of potassium strengthens the systole of the heart, lessens general blood-pressure, and therefore makes it easier to effect a balance of arterial and venous blood.

Acute congestion of the kidneys is so usually the first stage of acute nephritis that it is best considered as a part of it. In rare cases it develops and disappears before the inflammation is established. It is then a very transitory affection. This may occur in poisoning by such renal irritants as cantharides, turpentine, and similar drugs, or in poisoning by toxins generated in such infectious maladies as scarlet fever, diphtheria, and pernicious malaria.

INFLAMMATION IN THE KIDNEY.

As in the lungs or respiratory passages, inflammation in a kidney may affect only certain portions or structures of the organ, or affect them chiefly. Usually all the structures are somewhat modified, but either the glomeruli or the tubules or the interstitial tissues are chiefly affected. When renal inflammation is *acute* it produces *glomerular* or *catarrhal nephritis*. In the first instance the glomeruli and tissue immediately about them are almost exclusively modified; in the second the epithelium of the renal tubules is chiefly changed. When it is chronic two forms are clinically recognizable; chronic diffused or parenchymatous nephritis, and interstitial nephritis or renal cirrhosis. The former sometimes follows acute nephritis, and sometimes arises as a chronic affection. It is characterized chiefly by degenerative rather than inflammatory changes. In chronic interstitial nephritis all tissues of the kidney are involved, but the interstitial tissues are so much increased in amount that they form its most striking anatomical feature.

The effects of acute congestion and acute inflammation are to lessen the outflow of urine, to change its character, and, when inflammation is at all intense, to produce general anæmia and œdema, sometimes also uræmia in its varied forms. Pyrexia rarely accompanies acute inflammation of the kidneys, and is not high or of long duration.

The urine is lessened because the glomeruli and tubules are choked, and the latter often are also compressed. The glomeruli are filled, especially when the nephritis is of the glomerular variety, with desquamated epithelial cells which accumulate within Bowman's capsule

so as to compress the tuft of capillaries. The latter are usually distended, as far as compression will permit them to be, with blood. Extravasations of it also often partly fill the enlarged glomeruli. In other cases the glomeruli and peri-glomerular tissues are filled with leucocytes which compress the capillaries, distend Bowman's capsule and crowd the lymph-spaces in the surrounding tissue so as often to compress the adjoining renal tubules. It is easy to comprehend how such glomerular changes will make the urine scant. Before they develop, the afferent vessels and glomerular capillaries are usually deeply congested.

When there is acute catarrhal or parenchymatous inflammation the renal tubules are choked partly by blood from the glomeruli, providing very acute congestion precedes the inflammation, and by the epithelial cells so swelling as to nearly close the tubes. At the same time the cells become granular and loosened from the wall of the tubules. When thus loosened, and sometimes even before they have been cast off, they disintegrate. They and the granular detritus produced by their disintegration block the tubules completely in places. The calibre of the tubes is also partly obstructed by numerous casts which are elaborated from cells undergoing disintegration or degeneration. These are the most important ways in which occlusion of the tubules is produced, but congestion of the vessels between the tubules, distention of the lymph-spaces there, helps to cause it. These changes are most pronounced in and about the convoluted tubes and in the mild cases are confined to them. Both glomerular and tubular changes coexist, but in individual cases one may greatly predominate over the other. If acute catarrhal inflammation lasts for two, three, or more weeks the tubular epithelium becomes more coarsely granular and the cells disintegrate in larger numbers, filling the tubes with granules of fatty matter, for it is fatty degeneration which the cells undergo. In some cases, at this stage, just under the capsule of the kidney and about the interlobular vessels small areas of cirrhosis form. The period of degeneration may be prolonged over months and constitute one form of chronic parenchymatous nephritis. It is still the convoluted tubules which are chiefly affected. It is important to note that only a few of the cast-off cells, and a small amount of extravasated blood and granular débris finds its way into the loop of Henle. It is rare that any can be discovered in the ascending arm. So much of these substances as is recovered from the urine comes mainly from the tubules below the narrow loop of Henle. A little must find its way through, especially if the urine is alkaline and the granular matter and casts are thereby made more soluble and smaller. When recovery takes place the fat-granules are absorbed and fill the lymph-spaces in the interstitial tissues; new epithelium is rapidly reproduced; the

glomerular lesions also disappear, and repair may ultimately be perfect.

The urine is changed in character by the presence in it of abnormal ingredients and by diminished amounts of normal ingredients. The abnormal ingredients are albumin, blood, casts, and epithelial cells. The relative proportion of these various ingredients in the sediment of the urine gives one a key to the character of the renal inflammation in a given case. If blood-corpuscles and blood-casts are especially abundant we can justly conclude that congestion is great and hæmorrhages numerous. If epithelial casts and loose epithelial cells form the bulk of the sediment we know that it is a catarrhal nephritis with which we have to do. If albumin is abundant, casts moderate in number and mostly hyaline and granular, red blood-corpuscles present in small or moderate amounts, and epithelial casts and cells almost or quite wanting, we can conclude that the case is one of glomerular nephritis.

Urea, uric acid, and other soluble bodies usually excreted in the urine are diminished in amount whenever the renal tubules are much affected. As the urine is commonly much diminished in amount, the percentage of these ingredients in it may be increased, although in twenty-four hours they may be eliminated in amounts much less than normal. We possess no evidence so good as this of the extent to which the kidneys are involved. If a normal amount of urinary excreta is found, although the quantity of urine is small, we know that the epithelium is for the most part intact and doing its work.

These symptoms are guides in applying drugs to the treatment of nephritis, and will help to explain their mode of action. The suppression of urine leads to, or may threaten, uræmia. Coincidently the modification of the blood and of the normal functions of capillary walls produces dropsy. Pericardial, pleural, or pulmonary œdema may cause or materially aid in causing death. Nephritics are especially liable to bronchitis and pleurisy, which are also at times fatal complications. The first indication for treatment is to guard against these complications. Rest in bed and a uniform temperature about the body are of the greatest importance to accomplish this. If, with such care, a suitable diet is prescribed, many of the mildest cases can be conducted to recovery without medication. Exercise will so augment waste products in the blood that the danger of uræmia is increased. Dropsy can also be made to disappear more promptly if one is in a recumbent position. A safe rule is, therefore, to keep a patient in bed so long as the daily flow of urine is less than normal, and so long as there is œdema. It is of great importance that the skin be not suddenly chilled and that its function of elimination be encouraged. The temperature of the room in which acute nephritis

is treated should be kept at from 70° to 74° F. The air is to be kept fresh by ventilation. The patient must be protected from draughts. Woollen clothing next the skin helps to protect it and to encourage its functional activity. To promote the latter, either warm tub- or sponge-baths are useful. They should be followed by brisk rubbing which will both dry the skin and make it glow.

The diet must be such as the prevention of uræmia and the existence of albuminuria demand. This has already been described. Milk is to be used exclusively if possible.

To increase the flow of urine requires that (1) renal congestion be relieved, (2) the tubules be kept permeable, and (3) absorption by the renal lymphatics be promoted. In severely acute cases of nephritis active congestion may cause almost complete suppression of urine, aching in the back and loins, and usually mild or pronounced uræmia. Local depletion, and in the severest cases venesection, are the most efficacious means of relieving congestion. It is rare that bleeding is necessary. It can be best effected by moist cups or leeches. In milder cases dry cups and fomentation are sufficient. Fomentations alone will answer in the mildest cases. Poultices should be large so that they will cover the back from the shoulder-blades to the sacrum and come around the sides of the abdomen.

When the urine is very scant, highly albuminous, and bloody, digitalis is indicated. It will increase the flow of urine by increasing blood-pressure, and will contract the vessels, lessen hæmorrhage and the escape of albumin. Ergot, the perchloride of iron, and other astringents are rarely required in cases in which hæmorrhage is great.

Congestion can also be relieved by catharsis. Salines or calomel purges should be given at the onset and repeated daily or frequently. They aid in relieving renal engorgement, in preventing and relieving uræmia, and in removing dropsies.

It is most necessary to help to keep the renal tubules permeable in cases of acute catarrhal nephritis, for in these the tubules become most blocked with epithelium, casts, and the detritus of disintegrated cells. In cases of glomerular nephritis obstruction to the tubules is less, but not wanting. By keeping the urine alkaline, casts are formed in smaller numbers, are partly dissolved, and much of the granular matter is carried into solution. Alkaline diuretics will make the urine alkaline and therefore help to keep the renal tubules permeable. The salts most frequently used are the citrate, acetate, and bitartrate of potassium. An ounce a day, dissolved in water, is a common dose of either of them; often smaller amounts will accomplish the desired results. A physician should be guided by the reaction of the urine as to the dose which he will continue after the urine is once made alkaline. To maintain alkalinity the drugs should be given in

divided doses once in two or three hours. Copious draughts of water should also be given to promote diuresis and to wash the tubules of their contents.

Mercurials are important remedies in these cases, for in small doses given for several days in succession they will increase diuresis and the elimination of nitrogenous matter, and will as an alterative promote a better flow of lymph, the absorption of interstitial exudates, and even of foreign matter in the convoluted tubules. They are especially indicated in catarrhal cases. Calomel is usually preferred to other salts of mercury. A quarter of a grain or less should be given three or four times in twenty-four hours for as many days.

It is quite as essential that the quality of the urine should be improved as that it should be increased in quantity. When the urine is greatly lessened in amount and uræmia is present or imminent, to increase its quantity is most urgent, and for the time its quality may be neglected. To improve its quality is a prominent object of treatment in subacute and convalescing cases. Alkaline diuretics are chiefly relied upon to increase elimination of nitrogenous matter, but lithium benzoate and similar drugs may be employed. Albuminuria and hæmaturia modify the quality of the urine. Their treatment has already been described.

The treatment which is essential for uræmia and the renal congestion will help to eliminate dropsies. When there is anasarca only, and especially when it is moderate in amount, catharsis helped by diaphoresis and increased diuresis constitutes an efficacious treatment. Salines are often given daily to hold œdema in check or help to eliminate it. They can accomplish this best if given to an empty stomach in concentrated solution. No fluid should be taken until they have produced copious watery movements. A large amount of fluid may be withdrawn from dropsical tissues in this way. But if copious draughts of water are taken with or immediately after the saline purgative, the latter only hastens its absorption from the stomach and influences the dropsy little or none.

To promote diaphoresis hot tub-baths may be used in mild cases and hot-air baths for those unable to be moved from bed. Often a hot pack will provoke free sweating and with much less discomfort or exhaustion than a hot tub- or hot-air bath. By a hot pack is meant enveloping a person in a sheet dipped in water as hot as can be tolerated, immediately after which he is covered heavily with blankets. When anasarca is very great and does not lessen under the treatment just outlined, puncture of the œdematous tissue will give relief. This is accomplished by introducing in many places in the lowest portions of the œdematous tissues minute cannulæ. It, however, seems preferable to me to make a single incision over the malle-

olus of each ankle, an inch long and almost deep enough to touch the bone. If after this a rubber sheet is so placed under the patient's legs as to conduct the water away, and if the head of the bed is raised so that the fluid will gravitate to the feet, all the subcutaneous tissues can be emptied in a few hours. This method is especially adapted to those who are strong enough to sit up.

In acute nephritis vomiting is often persistent and frequent at the outset. It makes the administration of drugs and of water almost an impossibility. It is best relieved by lessening renal congestion and preventing uræmia. Cups, leeches, fomentations to the back, sulphate of magnesia hypodermically, or two or three drops of croton oil diluted with sweet oil upon the tongue or *per rectum* to deplete the kidneys, will lessen the irritability of the stomach more than anti-emetics. What has already been said of the treatment of vomiting in uræmia is applicable here.

Fever which occurs in acute uræmia, caused by cold or poisons absorbed from the alimentary tract, does not require special treatment. Chemical antipyretics are uniformly contraindicated. They increase the disorganization of the blood, many of them are renal irritants, and not infrequently when the kidneys are acting imperfectly therapeutic doses of them produce unfavorable effects—even fatal collapse. When nephritis threatens or arises in the course of infectious febrile diseases the bath-treatment which must be relied on for their relief can be continued. This and a proper diet are the best measures for the prevention of nephritis. Cold baths do not aggravate it when it is established.

During convalescence the greatest care must be taken to prevent relapses. Changes in the temperature of the room, clothing, and diet must be effected gradually and slowly. Exercise can be prescribed only with caution. The urine should be constantly watched as these changes are made. If the changes increase albuminuria or diminish the excretion of urine or cause albuminuria or œdema to return, they must be stopped or made more slowly.

Acute nephritis, if at all severe, produces marked anæmia which requires treatment during convalescence. Iron and bitter tonics, such as quinine and strychnine, will be found beneficial. So soon as the patient is well enough to take advantage of it an out-door life in a warm genial climate will complete the cure and stimulate repair better than medicines. This often necessitates a change of climate. It can be avoided, but is desirable if it can be afforded.

Something must be said of the prevention of acute nephritis. In the treatment of those infections which are often complicated, or followed by, nephritis, such as scarlet fever and diphtheria, a milk diet or when it cannot be taken a suitable substitute for it, with cleanliness of the

alimentary canal and skin, and an abundance of pure genial air to breathe, are the most efficient preventives. Much of what has already been said of the prevention of uræmia might be repeated here. Abuse of alcoholics, gourmandizing, exposure to cold and dampness, are at times avoidable exciting causes of acute nephritis.

Chronic parenchymatous nephritis or **chronic diffuse nephritis** can be regarded as a degenerative renal lesion rather than as an inflammatory one. It is true that it often begins as an acute catarrhal inflammation, but when it becomes chronic, fatty degeneration of renal epithelium is its most characteristic lesion. It is also true that the interstitial tissues are somewhat thickened and the glomeruli are modified in structure, but the gross as well as the most striking microscopical appearances are produced by fatty changes in the renal epithelium. The tubules are obstructed with cast-off cells, cellular débris and casts. Many of the glomeruli are made functionless by thickening of their capsules and by hyaline changes in them and the capillaries. The interstitial tissues are slightly increased in amount and apparently thickened by distention of their lymph-spaces with fat absorbed from the convoluted tubules and often by serous exudates. The functional incapacity of the kidney is the same as in acute catarrhal nephritis. The same indications for treatment exist, plus such treatment as the degenerative changes and chronicity of the lesions may demand. In rare instances the disease persists for many years. Interstitial hyperplasia may then predominate, the kidney contracting and all the phenomena of interstitial nephritis developing as a sequel to chronic diffuse nephritis. Chronic nephritis is liable to acute exacerbations, which for the time resemble symptomatically acute nephritis. A few cases are denominated chronic hæmorrhagic nephritis, because of profuse, persistent, or recurring hæmorrhages.

A diminished excretion of urine and urinary solids, and a tendency to fatty degeneration of epithelium demand correction. Uræmia is common. It is, however, usually chronic in form. Acute uræmia is much less common in this than in any other form of nephritis. If it does occur it is generally when there is an acute exacerbation of the disease, or when the stage of contraction is reached. Œdema is, with rare exceptions, an early and marked symptom. When it has once appeared it seldom wholly disappears, or if it does it reappears soon. It is, however, subject to great variation from time to time. Anæmia is also present, which with malnutrition produces an earthy, grayish color of the skin. In hæmorrhagic cases anæmia may be more profound and cause a clearer pallor. Digestive disorders may arise as complications, but are oftener due to mild uræmia. Strength and flesh are gradually lost.

It must not be forgotten that a group of cases of chronic albu-

minuria exists unaccompanied by loss of strength, anæmia, uræmia, or diminished excretion of urine, in which there is sometimes a large, sometimes a small percentage of albumin voided. The urinary sediment is very small in amount, contains few or no cells, no renal epithelium, a few hyaline and finely granular casts. As a rule these patients feel well and may continue so during a long lifetime. They often finally succumb to an intercurrent disease. While such persons must be looked upon as suffering from the most benign of chronic renal maladies, that they have diseased kidneys and are prone to develop more serious trouble in them must be recognized.

Apoplexy, hemiplegia, and retinitis are not common complications of chronic diffuse nephritis. The dangers which must be averted are acute exacerbations, uræmia, œdema, or inflammation of serous sacs or of the lungs or heart. The prophylactic measures applicable to acute nephritis are equally applicable to acute exacerbations of chronic nephritis, and have already been described; so, also, has the prophylaxis of uræmia. Measures which lessen œdema or hold it in check are the only ones which will lessen a tendency to dropsy of serous sacs. Protection from cold and dampness by warm clothing and dry dwellings, or better still by a residence in warm equable climates, is most certain to prevent inflammatory complications such as endocarditis, pericarditis, or pleurisy. Those who suffer from chronic nephritis should make a permanent, or at least a winter, residence, if they can afford it, in a genial, equable, and dry climate, such as exists in western Texas, Arizona, or southern California. The dryness of these regions increases the elimination of fluid by the lungs and skin and thus helps to diminish œdema. If there is no œdema a warm winter climate will be sufficient, such as can be found in most of our Southern States. If there is much œdema a climatic change is not indicated; for a patient is then too feeble to take long journeys, and the comforts of home are essential to his well-being.

The treatment already described for acute nephritis is applicable to chronic diffuse inflammation of the kidneys so far as drugs are required to promote diuresis. If, as happens now and again during periods of remission in the disease, the urine becomes normal in amount, normal in specific gravity, and œdema disappears, diuretics should of course be discontinued. Treatment of albuminuria can then be tried. The hæmaturia of hæmorrhagic cases must be overcome by the remedial agents described above. Œdema is more persistent than in acute cases, and treatment seems less efficacious. For its relief, as in acute nephritis, diuretics, cathartics, and diaphoretics must be used. Ankle-incisions must oftener be resorted to. By these, if the œdema has not been of too long standing, perfect drainage will be effected, but if the œdema has been very chronic the subcutaneous and inter-

stitial tissues will have become thickened by cell-proliferation and the lymph-spaces will thereby be partly occluded; the normal free and almost universal anastomosis of lymph-spaces will be destroyed. For this reason, also, the making of ankle-incisions repeatedly will form a less and less efficient mode of draining the tissues as time passes. Drainage can be made more perfect in such cases if before the incisions are made vigorous massage is practised. It should be practised so long as the incisions are open and serum flows from them. I have seen great relief afforded by the repetition of incisions three and four times, at intervals of a month or two. It is rare, however, that they prove very effective after the second time.

Considerable dropsy of the pericardial sac demands the removal of the fluid by aspiration. Pleural dropsy rarely endangers life. At times it may form a serious lesion and will require aspiration. Before these forms of dropsy develop the more usual treatment for œdema has generally been thoroughly tried and failed. Aspiration then becomes a necessity so soon as enough fluid accumulates in the pericardium or pleuræ to endanger life.

In even mild cases warm baths should be taken frequently to increase the activity of the cutaneous glands. They should be taken every fourth or fifth day. If uræmia exists, the hot bath or pack may be used daily. Serous, cardiac, and pulmonary inflammations require the treatment appropriate to them under other conditions. When they complicate nephritis they make the prognosis especially grave.

Fatty degeneration has been described as the characteristic lesion of this malady. It is best combated therapeutically by those measures which improve nutrition. It is in this class of cases that iron is of especial service. It must often be given for months at a time. The best results are obtained by a change of preparations from time to time, and by the use of those only that are least irritating to the stomach. My own preference has been for the citrate and potassio-tartrate of iron, ferratin, and desiccated blood. Moderate doses will give as good results as very large ones. Of medicinal agents iron may be regarded as the one constantly applicable. Oxygen is given by inhalation with the hope that it will promote more perfect metabolism. It is well known that no more oxygen can be taken by blood-corpuscles from pure oxygen gas than from air. How, therefore, can it do good in nephritis? Clinical experience has seemed to me to demonstrate its inutility unless there is obstruction to respiration by bronchitis, asthma, œdema of the lungs, or similar affections. Whenever aëration of the blood must be effected in an unusually small area of lung-tissue oxygen is of great value. Although oxygen is of little use, fresh air—if possible, out-door air—sunshine, and cheerful surroundings are of great value, as they stimulate better nutrition.

Although in acute nephritis a patient is best kept in bed so long as there is œdema, the same rule cannot be enforced in chronic cases. If œdema is not considerable, gentle exercise, not too long continued, is wholesome. When œdema interferes with walking or is much increased by even short walks, massage may be substituted for active exercise. Massage should be practised with care that the patient may not be made too weary and tissue-waste unduly augmented.

An abundance of pure water should be constantly taken as a diuretic. Many patients are benefited by a visit, for one or two months annually, to springs like those at Waukesha in Wisconsin. The change of scene, of food, of air, of life, stimulates the patient, encourages hopefulness, and improves nutrition. At such places hot baths are taken often and with regularity. Several quarts of water are usually drunk daily, for at a spring a patient will drink freely of a water which they will only use sparingly at home. The example of many drinking at the spring inspires each one to imbibe freely. Springs must be chosen which are in pleasant country towns, where appropriate foods can be readily obtained, and where the waters are peculiarly free from both inorganic and organic matters.

During periods of acute exacerbation a milk diet should be maintained if possible. At other times a diet of non-nitrogenous food with milk as a staple should be prescribed. Amylaceous foods and fruits are the best. If the kidneys eliminate a normal amount of nitrogenous matter and water, and if œdema is gone or trifling, a little of those albuminous foods already described as least harmful in albuminuria may be permitted. Their effect upon the quantity of albumin in the urine should be constantly watched. If they increase it, they must be interdicted.

Mercurials are useful in this form of nephritis for the reasons already assigned for their employment in the acute form of the disease. They are usefully employed intermittently, for perhaps a week at a time.

Even if cathartics are not indicated by lessened urination or œdema, they should be given often enough to prevent the accumulation of much fæcal matter or the products of intestinal fermentation.

If the renal lesion is being transformed into a cirrhotic one, mercurials are supposed to be indicated because they often modify plastic inflammation, help to bring about a resolution, and prevent interstitial hyperplasia. Undoubtedly in all stages of the disease the tendency of the drug to stimulate the flow of lymph helps to free the interstitial tissues of the kidney of detritus of disorganized cells absorbed from the tubules. The removal of this with greater rapidity will lessen the tendency to hyperplasia about the lymph-spaces and blood-vessels. The iodides have sometimes been used in the same

cases and for the same purposes, but they can rarely be used efficiently, for they disturb digestion.

The heart may undergo hypertrophy even in the early stage of this malady, but usually such changes only occur after the kidney becomes cirrhotic. The heart grows feeble in proportion as nutrition is impaired and general strength is lost. Cardiac weakness is often increased and sometimes precipitated by endocarditis or pericarditis. A rapid, feeble action of the heart is common in all severe cases and increases dropsy. Cardiac tonics are then demanded. The best are digitalis and strophanthus.

Amyloid infiltration of the kidneys and chronic diffuse nephritis are commonly associated in varying proportions. The lesion of amyloid infiltration and its location is so well known that it requires no description. Unfortunately we do not know its exact mode of production. No known treatment will produce resolution in the tissues in which amyloid deposits have taken place. Treatment must therefore be directed rather to the coincident parenchymatous changes, and does not differ from that of chronic diffuse nephritis. In rare instances recovery has taken place when the lesion was not of long standing, or improvement has occurred in more prolonged cases by removal of the conditions under which amyloid infiltration takes place. When, as oftenest is the case, chronic suppuration is its cause, complete drainage of the abscesses may check the amyloid disease. So surgical treatment of chronic destructive osteitis or periostitis may check or bring about spontaneous recovery from amyloid disease. It is common in cachexia from tuberculosis, syphilis, and leukæmia. Treatment of these diseases may check its progress, and in the case of syphilis rarely effect a cure. Usually these diseases are incurably fastened upon a patient before amyloid infiltration occurs.

Interstitial nephritis, or renal sclerosis or atrophy, is the most chronic of all the renal affections. It is impossible to fix its exact time of onset, so insidious is its beginning and development. It may exist for five or twenty-five years. The first is probably the commonest length of its course.

It is characterized by a destruction of glomeruli and renal epithelium, morsel by morsel. Except where minute particles are destroyed the renal tissue is sound. The glomeruli involved atrophy, the tuft of capillaries shrivels or disappears, the capsule thickens and contracts. The epithelium of the tubules grows small, disintegrates, disappears, and the tubule is obliterated by hyperplasia of connective tissue which takes place as atrophy advances in the tissues functionally important to the organ. Endarteritis and often obliterating endarteritis occurs in the affected regions. Although the lesions spread very slowly they finally destroy much of the secreting power

of the kidneys. As in other than the affected parts of the organs glomeruli and renal tubules are normal, less change is wrought in the character of the urine than in the other varieties of Bright's disease. And as the kidneys atrophy gradually, during many months and often many years, the individual will as gradually lose flesh and, less perceptibly but quite as surely, strength. Loss of flesh is generally not considerable. It is so slow that it is rarely looked upon as pathological. Digestive disorders, headache, or uræmic symptoms usually first call for treatment. The existence of the disease is not unfrequently overlooked until acute uræmia demonstrates it and causes sudden death.

Atheroma or general endarteritis is associated with renal atrophy in many cases, and is often the cause of the renal changes. In minute areas, because of the imperfect supply of blood through the narrowed arterioles, atrophy occurs, and connective tissue hyperplasia, which is the correlative of atrophy of highly differentiated structures, develops. But all cases are not the result of arterio-sclerosis. In some instances destruction of renal tissue morsel by morsel is probably effected by chemical irritants or poisons ingested, made in the intestinal tract or tissues, which act intermittently rather than constantly. When renal atrophy has occurred the heart must hypertrophy and blood-tension must be raised to make that portion of the kidneys which is still active capable of eliminating a normal amount of waste. High arterial tension and cardiac hypertrophy are quite as much a part of the disease as renal atrophy. If there is generalized endarteritis it also will lead to enlargement of the heart and arterial rigidity. Occasionally the lesions of chronic diffuse nephritis precede and rarely are superimposed upon those of the chronic interstitial form.

The physiological results of this renal atrophy are elimination of urine in increased amounts. This is due to high arterial pressure and a healthy condition of numerous glomeruli. Those Malpighian bodies which are destroyed are impermeable; those in the process of destruction, which are few at any one time, produce the minute amount of albumin that is found in the urine. As the destruction of renal tissue often goes on intermittently, albumin is many times a variable ingredient in the urine. In the early stages when disease involves only a very few tubules and only minute areas in any one, casts and cells may not be discoverable in the urinary sediment. Later in the course of the malady, and especially if its slow course is slightly quickened, a few hyaline or finely granular casts will be discoverable. Renal epithelium and blood-corpuscles are almost constantly absent. Casts and cells are more abundant in the third stage of the disease when the heart is dilated and weak, and when the balance between arterial and venous circulation is destroyed. Although the quantity of urine

is greater than normal so long as the heart is strong, the quantity of nitrogenous matter eliminated is only normal or less; therefore the urine has a low specific gravity. It is lowest when the kidneys are much atrophied and the heart is still strong. Its percentage may increase and the quantity of urine may diminish when the heart flags, but even then the quantity voided in twenty-four hours is often subnormal. The great danger of uræmia is evident. This danger is increased by coincident indigestion, intestinal fermentation, sluggish action of the liver, and therefore imperfect metabolism. Uræmic coma is commoner in this form of Bright's disease than convulsions. Acute uræmia, even fatal, often occurs without premonition and unexpectedly; chronic uræmia is also common. Pressure suddenly increased within arteries that are atheromatous frequently causes their rupture; cerebral apoplexy is therefore a not uncommon complication of interstitial nephritis. It is the immediate cause of death in many cases. Hæmorrhages may occur into the retina and produce blindness or blurred vision, or it may be into other tissues. Whenever extra work is continuously demanded of the heart it hypertrophies, providing it is well-nourished; it cannot, however, by hypertrophy keep pace indefinitely with the increasing demands for work, therefore if a patient is not killed by uræmia, apoplexy, or some intercurrent trouble, the natural termination of the malady is cardiac weakness, dilatation, and all the changes characteristic of asystole.

The most important indications for treatment of renal atrophy are (1) if possible to remove the cause of it, that the disease may be stopped in its progress; or, if that is impossible, (2) to avert the commonest fatal complications, such as uræmia, apoplexy, and cardiac exhaustion, that the course of the disease may be prolonged. These complications are least liable to occur in the earliest stages of the malady; it is therefore important to recognize interstitial nephritis in its incipiency and to meet the indications early.

The disease is eminently one of mature life, death from it occurring almost exclusively between the fortieth and seventieth, and oftenest between the fiftieth and sixtieth years. It is between thirty-five and fifty that its beginning must be sought in those who by disposition, disease, or mode of life are liable to it. So often does it complicate the uric acid diathesis that atrophied kidney is frequently spoken of as gouty kidney, especially in those countries where gout is common. It is therefore important in a very large number of cases to employ as prophylactic measures those that must be used for gout. The diet should be simple, rather abstemious; especially should large quantities of meat be proscribed, and highly spiced or seasoned food. Alcoholics should not be used. Pure water should be drunk freely. If possible an out-door life should be led and exercise enough taken

to maintain active and complete tissue-change. Indigestible foods must be avoided. Digestive disorders must be promptly corrected. Whether it is uric acid or some other less well known ingredient of the blood that provokes renal atrophy we do not know. If it is not uric acid, it is something which increases in the blood simultaneously with it. Chronic lead-poisoning can produce the same lesions as gout, and can, indeed, provoke the latter. Lead salts should not be employed as medicine in this disease, and accidental lead-poisoning should be prevented. Syphilis undoubtedly produces a few cases of renal atrophy. Sometimes its specific treatment will check the progress of the disease or even prove curative. Chronic malaria is a much less common although undoubted cause of it. Quinine may have quite as curative an effect in such cases as mercurials in syphilitic ones. We know of no way to combat with certainty atheroma, which is so common a cause of chronic interstitial nephritis. Good hygiene, freedom from mental and physical over-exertion, and life in a bland, genial climate will most surely prolong life in such cases.

Uræmia in interstitial nephritis is the result sometimes of such destruction of renal tissues that normal elimination can no longer be maintained. Much oftener it is due to partial renal incompetence and to accumulation in the blood of products of intestinal fermentation and of imperfect metabolism. The treatment of uræmia has already been described. It is important in these very chronic cases to instruct patients to watch carefully the quantity of urine voided. This can only be done by measuring all that is eliminated in twenty-four hours. Such measurements of the urine should be made once in seven to ten days during the earlier part of the disease's course and oftener in the later part. After a few measurements and simultaneous analyses the quantity that must be secreted by the individual, in order that a normal elimination may take place, can be ascertained. Whenever he finds that he is making less, he should be instructed to call upon his physician for a modification of diet, or diuretics may be needed. It is well to inform him what are the common symptoms of mild uræmia that he may place himself under treatment so soon as they arise. The need of clean intestines and freedom from indigestion should especially be explained. When uræmia threatens, a strict diet, such as has been described, must be employed, but during most of the long course of this disease the diet can be varied almost as it would be in health. A patient should eat less, especially less of meats and of rich and highly spiced or dressed foods. Those articles that are most inclined to ferment in the alimentary tract should be avoided. Alcoholics should be interdicted. Water must be taken freely. Exhalation from the skin should be promoted by warm baths and friction.

The second group of dangers—cerebral hæmorrhage and cardiac exhaustion—arise from high arterial tension. If arteries are atheromatous it is especially necessary to lessen arterial tension and to prevent a sudden increase of it. Digestive disorders and constipation are the commonest causes of high tension. The frequent—or, if necessary, the constant—use of laxatives will empty the intestines and lower arterial pressure. Food and medicine must be adjusted to prevent slow digestion and fermentation within the stomach. Overexertion, either mental or physical, will increase arterial tension, and must be avoided. While prolonged and violent exercise is interdicted, gentle exercise is a necessity to maintain good lymph-circulation and good metabolism.

To suddenly chill the surface of the body will disturb nutrition, temporarily increase arterial tension, and will often excite in the nephritic, who is particularly liable to inflammation of the organs of respiration, dangerous bronchitis, pleurisy, or pneumonia. Careful protection of the skin by woollen garments is therefore necessary. If possible, these patients should not live in damp, changeable climates, at least not during the inclement seasons.

Nitrites can be employed from time to time with advantage to lower blood-pressure. Nitro-glycerin and sodium nitrite are the preparations to be preferred. They are often prescribed for weeks at a time. Some individuals cannot use them, for they are apt to produce uncomfortable headache when employed in full doses. The tinctures of veratrum or aconite with sweet spirits of nitre may be prescribed in their place. The iodide of potassium also lessens arterial tension and can be used for long periods of time more comfortably than the nitrites. It does not relax the arterioles to the same extent, but produces a more prolonged effect, and therefore does not need so frequent repetition. It too cannot be used by certain individuals because of their susceptibility to iodism, or because it disturbs their digestion. When the heart is hypertrophied and arterial tension is high, digitalis, strophanthus, their congeners, ergot and strychnine, are contraindicated.

In the last stage of the disease, when the heart grows weak, the kidneys act less freely, and œdema develops, the danger of uræmia increases and must be averted with redoubled care. The pulse grows small, is softer and quicker. Strophanthus can now be used advantageously to temporarily strengthen the heart and increase diuresis. Even digitalis can be employed with safety. Iron and bitter tonics are useful to stimulate nutrition. Rest and a milk diet, or at least a non-albuminous one, are a necessity. Alkaline diuretics, cathartics, and diaphoretics must be used often or constantly to avert uræmia and to hold in check or to lessen œdema.

Such drugs as the iodides, mercurials, and double chloride of gold and sodium have not infrequently been employed in renal atrophy, hoping thereby to lessen the formation of new connective tissue. I believe the latter of them has been generally discarded as useless. I have obtained no perceptible results from it. The good effect of the iodide of potassium must be assigned to its influence upon blood-pressure rather than to its alterative properties. The mercurials do good as intestinal antiseptics and diuretics. Moreover, the renal atrophy is not to-day thought to result from connective-tissue hyperplasia. The latter fills a gap caused by atrophy and disappearance of normal tissue. It is a general law of pathology that such hyperplasia occurs whenever neighboring highly differentiated structures are destroyed. There is therefore no reason why the increase of renal connective tissue should be combated. It is destruction of tissue peculiar to the kidney that must be prevented.

Pyelitis may be acute or chronic, and treatment must be adapted to each state.

Acute pyelitis is commonly due to stone in the kidney's pelvis. It may be caused by toxic agents which are eliminated by the kidneys during fevers. As a rule, this latter form is a mild affection which disappears spontaneously when fever subsides. Acute inflammation of the renal pelvis may also develop by extension of blennorrhœa or other suppurative disease from the lower urinary organs. It is evident that prophylactic measures can be successfully instituted against only a part of these causes. If a stone exists and is a constant source of irritation, it must be removed to effect a cure. Pyelitis which accompanies fevers can be prevented or lessened in intensity by a milk diet, copious draughts of water, and hydropathic treatment, for by these means the urine will be diluted and become less irritating. Whenever the urinary channels are infected, especially when the bladder is, as speedy a cure as possible must be effected to prevent the development of pyelitis by extension of infection. In such cases the bladder must be emptied frequently and perfectly. For if urine is long retained and the bladder is distended, the chances of extension of disease to the kidney are greatly increased.

When acute pyelitis is detected, local depletion will often give much relief to the pain in the back which the patient usually feels, and will shorten the course of the inflammation. It is best effected by leeches or cups over the kidneys. In mild cases counter-irritants can be substituted for these measures. Fomentations applied to the back after local bleeding or counter-irritation will prolong their good effects. Depletion can also be accomplished by catharsis. Drastic or calomel purges are to be preferred to salts. The latter are in part eliminated by the kidneys and are slightly irritating to the pelvis and

bladder. Not only do these remedies deplete but they also remove from the intestinal canal materials which would otherwise be absorbed, eliminated through the kidneys, and prove irritating to them.

It is also necessary to make the urine thin and bland, that it may be as little irritating as possible to the mucous membrane of the pelvis of the kidneys. This is best accomplished by encouraging copious libations of water and by a milk, or at least a liquid, diet.

In the more severe cases pain in the loins is hard and requires relief. Generally local depletion and fomentations will mitigate or remove it. The latter can be made more anodyne by adding to them opium or belladonna, or both. The tinctures of these drugs can be mixed in a poultice, or belladonna-leaves can be added to the flaxseed which is used in its composition. If pain cannot be relieved by these measures, morphine or codeine must be given by the mouth in sufficient doses to accomplish this.

Antiseptics have been administered *per os*, with the hope that they would lessen or prevent suppurative pyelitis. They have proved of little use, and by many are no longer employed. Those that have been most used are salol, naphthol, and resorcin. All the antiseptics that have been tried are more or less irritating to the kidneys, and must be used with caution when there is acute renal inflammation. Saccharin will prevent fermentation in urine, and when administered by the mouth will make it strongly acid. Both of these properties make it, theoretically, of probable utility; moreover, it can be given in large doses without harm. A few clinicians have reported favorable results from its employment in pyelitis. I have not tried it in acute cases; in chronic cases it will render the urine acid. Its antiseptic power is easily demonstrable in the laboratory, but not so easily at the bedside.

Chronic pyelitis usually follows acute attacks, and arises from the same causes, but it may result from obstructions of the ureters or urethra. The latter may be due to stone or other foreign body in the ureter, or to compression by tumors, cicatricial tissue, or thickening of the walls of the urinary channels. Inflammation may extend from areas of chronic inflammation in the bladder, urethra, or renal parenchyma. Chronic pyelitis is liable to acute exacerbations. These must be guarded against by warm clothing, and, if possible, a life in an equable climate. The ingestion of renal irritants, or their absorption from the intestinal tract, must be guarded against. Excess of physical exertion should be avoided, especially if pyelitis is due to calculus. It goes without saying, that whenever possible the cause of the malady must be removed. This can sometimes be accomplished by surgical procedures, very rarely by medical ones.

As in acute cases, food must be bland. During periods of acute

exacerbation it should be liquid only; at other times it may be varied. It may be like that eaten in health, but articles which contain oxalates and other renal irritants must be avoided. Care should be exercised to limit gastric and intestinal fermentation, and regular, copious bowel-movements should be maintained. The creation and absorption of renal irritants can thus be lessened. Water should be taken copiously to make the urine bland, to flush the kidney and to help keep the pelvis clean. Two quarts of pure water ought to be taken daily. What has already been said of the use of water in lithiasis is applicable to cases of pyelitis calculosa. If chronic pyelitis is characterized, as it so often is, by slight suppuration, sulphur-waters can be used advantageously, as they lessen and prevent suppuration.

Balsamic preparations are employed in these cases, chiefly to prevent or to lessen suppuration because of their antiseptic properties. They are applicable when the parenchyma of the kidney is not involved, for they tend to congest, and in large doses to inflame it. Benzoic acid and the benzoates are among the best of these. Benzoic acid is soothing to inflamed mucous membranes. It makes the urine acid, and is mildly antiseptic. It can be given as benzoic acid or as a benzoate of sodium or lithium or as an emulsion of gum benzoin. The oil of sandalwood is well tolerated by many individuals; and it, too, lessens suppuration in the urinary channels. Copaiba and cubebs are too apt to disturb the stomach, if used in efficient doses, to be very useful in chronic pyelitis. Often infusion of buchu is prescribed. Nuclein has been much experimented with during the last two years, because of its possible power of combating deep-seated suppuration by its antiseptic property and ability to provoke leucocytosis. There are few reports in our current literature of its trial in pyelitis. I have employed it in several cases without positive results. One of these cases was due to cystitis which was provoked by retention of urine because of paralysis. At the time the patient came under treatment the pelvis of the right kidney was greatly distended with pus. Prompt and very great improvement was effected, indeed almost a cure, by the use of nuclein and by frequently emptying the bladder through a catheter. This latter procedure drained the distended kidney. At the same time the cystitis was treated by washing the bladder with mild antiseptics. I have seen just as good results obtained from the latter procedures only, and do not feel that the good effect observed can with certainty be ascribed to nuclein. I had at the same time another patient under treatment whose pyelitis was due to renal tuberculosis: although nuclein was employed most patiently I could detect no good results. In the mildest cases in which I have employed it positive results have also been wanting.

Astringents are used to lessen the formation of inflammatory

exudates, both mucus and pus. In mild cases, especially those characterized by mucous rather than by purulent exudates they are sometimes useful. Many times they are employed in alternation with balsamic preparations. One is used for a week or two, and then the other.

In both acute and chronic cases complicated by hæmorrhage, the treatment described above for hæmaturia must be used.

Kelly of Johns Hopkins Hospital has succeeded in not only removing from the pelvis of a kidney considerable amounts of sand and small gravel by catheterizing the ureter, but has succeeded in cleansing it with antiseptic washes. Such treatment has in his hands proved as efficacious as washing the bladder does in cystitis. Unfortunately it is a difficult procedure. It, however, creates hope of success in many cases that would be hopeless with other medical treatment.

In all acute cases and acute exacerbations in the course of chronic ones, rest in bed should be enjoined. In mild chronic cases gentle exercise may be permitted and is even useful, for it helps to maintain better general health, but great or prolonged exertion should be avoided.

If suppuration is considerable and successful drainage cannot be maintained through the ureter, a surgical operation is necessary in order to establish it.

(See also the latter part of Dr. Belfield's article.)

THERAPEUTICS OF THE GENITO-URINARY DISEASES OF WOMEN.

By EDWARD E. MONTGOMERY, M. D.

INFLAMMATORY DISEASES.

A PROPER recognition of the creative influence of bacteria in the production of the various forms of inflammation has necessarily led to many modifications of our plans of treatment for diseases of the genito-urinary tract in women. Its acceptance cannot but impress the physician with the importance of the most conscientious practice of cleanliness, not only in operative procedures, but in the ordinary manipulations for examination and local treatment. When we review the early record of this branch of practice it becomes a serious query, from which the patient has endured the greater risk—her disease, or the efforts pursued for its relief.

In the study of inflammation of this tract, the interdependence of the various local forms should not be forgotten. Thus, it is difficult to conceive of a severe inflammation of the vagina without an involvement of the vulva and cervix. The rapid extension of inflammation through the entire tract, lined as it is by a continuous membrane, justifies us in the consideration of the "inflammatory diseases" of these structures as a group. The frequently rapid progress of serious inflammation, the early production of pathological changes which impair or destroy the function of the reproductive organs, and the peril to the future comfort or even life of the individual, require such an arrangement of the subject.

The predisposition to the development of local inflammation is largely due to improper hygiene. Improperly constructed, insufficient and injudicious clothing, poorly regulated diet, want of care and cleanliness, neglect of exercise, are all important factors.

While we may not always be able to establish the original site of an inflammatory process, for purposes of study and description, it is more convenient to take up its consideration in a progressive course from without inward.

INFLAMMATIONS OF THE GENITAL TRACT.

Vulvitis.—Inflammations of the vulva present diverse appearances according to the structures involved and the cause of production.

Attempts have been made to indicate these differences by designating them as various forms of vulvitis, but when we recognize that in each case it is inflammation, the division into diffuse and circumscribed would seem preferable. The latter term may be applied to what is sometimes known as follicular vulvitis.

Inflammation of the vulva may arise from want of cleanliness, from decomposing lochia or menstrual discharge, from diabetic or decomposed urine, or constant bathing of the parts with urine, as in a vesical fistula or from incontinence, from uterine or vaginal discharge, gonorrhœal infection, puerperal sepsis, and in young children, from seat-worms.

The TREATMENT will depend upon the cause and extent of involvement. A slight inflammation of the vulva may arise from want of cleanliness, and the consequent retention of decomposing secretions. The skin between the folds of the labia majora and minora is richly provided with sebaceous glands. The decomposing sebaceous matter mixed with the vaginal secretion produces an exceedingly unwholesome and offensive odor, the tissues become irritated, scaled, and abraded. Pruritus is intense. Frequently, careful washing with soap and hot water, and the separation of the parts by pledgets of cotton, oakum, or lint, leads to speedy relief.

The treatment of the gonorrhœal form will be discussed with the subject of Vaginitis.

The first step in the treatment of any form of vulvar inflammation must be the determination and removal of its cause. The urine should be carefully examined. The association of vulvitis with diabetes may be suspected when the inflammation extends over the labia, perineum, and adjacent surfaces of the thighs, particularly if the parts present numerous whitish points or tufts, the algæ, or yeast-fungus. The pruritus is intolerable.

The diffuse variety is not infrequently complicated by inflammation of the orifice of the urethra, the ducts and glandular structure of Bartholin's glands, the loose cellular tissue, and the inguinal lymphatic glands.

In the acute forms the patient should be kept quiet, the parts frequently washed or douched with an antiseptic fluid—corrosive sublimate (1 : 5000), carbolic acid (1 : 50).

In the early stages the application of cold, the ice-bag, or cold lotions will frequently ameliorate its gravity. The ice-bag should not be continued sufficiently long to endanger necrosis. In the later stages, hot antiseptic solutions will be more efficacious : lint or gauze saturated with the solutions of sublimate and carbolic acid already named, or borax 1 : 100, covered with rubber dam or wax-paper, and kept in place by a T-bandage. Where there is much secretion the parts should

be frequently washed with hydrozone, dried with absorbent cotton or gauze dusted with iodoform and tannin (4 : 1), aristol and desiccated alum (8 : 1), or the stearate of zinc. The application of the powder, in addition to its inhibitory action upon germ-production, keeps the inflamed surfaces apart. The separation of the surfaces is very important and may be more effectually accomplished by the use of pledgets of lint, absorbent cotton, sterilized gauze or prepared oakum. The pledget may be utilized for the more continuous action of a drug by the application of diachylon ointment, ichthyol in lanolin (1 : 12), or ammoniated mercury ointment (15 grains to the ounce).

Suppuration of the vulvo-vaginal glands should indicate early incision. The opening, after irrigation, should be packed with iodoform gauze. If the gland has not broken down it is best removed, as its retention after obliteration of its duct will lead to the formation of a cyst. Abscess of the loose cellular tissue should be promptly evacuated and drained. The vulvitis produced by diabetic urine is promptly relieved by washing with a solution of sodium hyposulphite ($\frac{1}{2}$ ounce to the pint), and keeping the surfaces apart by pledgets medicated with diachylon ointment.

The *circumscribed* or *follicular vulvitis* is frequently exceedingly obstinate; the separate hair-follicles seem to become involved without inflammation of the intervening skin. In obstinate cases it is better to shave the genitalia, puncture and cauterize with stick silver nitrate each affected follicle, and keep the parts covered with ammoniate-of-mercury ointment.

Infants and young girls not infrequently develop vulvitis from want of cleanliness. Occasional epidemics of the disease are seen in schools and infirmaries, due to infection. The development of such a condition should be considered an indication for prompt treatment, as extension of inflammation to the deeper structures is not infrequent before puberty and affects their development and the subsequent performance of their functions.

The retention of sebaceous secretion beneath the prepuce of the clitoris is capable of setting up an adhesive inflammation which fixes the prepuce over the entire glans. When it has been long continued, the glans and clitoris are poorly developed, the retained smegma often produces itching, irritation of the bladder, nervous phenomena, occasionally convulsions, and not infrequently leads to the practice of masturbation. The prepuce should be stripped back, all particles of secretion removed, and the parts subsequently be kept clean. Where the prepuce is so long as to completely envelop the glans like a hood, the reproduction of the condition may be obviated by removing with scissors a piece of skin about one-half inch above the glans and introducing sutures. This procedure exposes the glans.

Pruritus is a very common symptom of vulvar inflammation, and is relieved by treatment adapted to the causal condition, but we sometimes find severe pruritus unaccompanied by signs of inflammation. Its existence should always lead to careful examination for a local cause. The diet should be carefully regulated and the general health improved.

Efficient local applications are a 2 to 5 per cent. solution of carbolic acid, chloral ($\frac{1}{2}$ drachm to the ounce), diachylon ointment, or ointment containing 5 per cent. carbolic acid, and 10 grains cocaine to the ounce. In very obstinate cases, painting with a stronger solution of carbolic acid, nitrate of silver (30 grains to the ounce), or tincture of iron chloride may be required. Where the itching is confined to small spots they may be removed. Fehling gave permanent relief in an obstinate case by removing both labia majora and the clitoris. Smyly advises equal parts of powdered alum and sugar, dusted over the parts.

Vaginitis.—Inflammations of the vagina may be considered as acute and chronic, simple and specific, or gonorrhœal. The character of the inflammation is somewhat dependent upon the age of the patient.

The normal discharge from the vagina, according to Döderlein, is a whitish exudation of the consistence of clotted milk, of an intensely acid reaction, containing an almost pure culture of the vaginal bacillus. Other micro-organisms, as the oïdium albicans and the yeast-fungus, are rarely detected. So long as the vaginal discharge remains normal, the mucous surface is particularly resistant to the encroachment of disease.

It is generally contended that the vagina is rarely the original site, but becomes involved by extension of inflammation from either the cervix or vulva. The normal vaginal discharge is necessarily modified by the alkaline discharge from the cervix during menstruation, the puerperium, endometritis, and cancer. Sexual intercourse may convey saprophytes, tubercle bacilli, gonococci, and other germs.

The mucous surfaces of the vagina are rendered more vulnerable to the encroachment of disease by the causes given, by sloughing myoma and septic puerperal affections; by contact with irritating alkaline urine and fæces in vesico-vaginal and recto-vaginal fistulæ, by retention of badly fitting and foul-smelling pessaries, by the use of too hot vaginal douches, too long retention of tampons, the introduction of an infected syringe-nozzle, or careless examination with dirty hands and instruments.

Certain constitutional conditions favor the production of leucorrhœa, as tuberculosis and anæmia. Vaginitis may be caused by the exanthemata, diphtheria, erysipelas, and dysentery.

In the TREATMENT, where possible, the first consideration must be the removal of the cause.

In the acute form, the vagina may be irrigated with either hot or cold mild antiseptic douches. When severe, and especially in the gonorrhœal form, it will be complicated by inflammation of the vulva. Hot antiseptic fomentations and hot sitz-baths will be found grateful. The patient should rest in bed. The importance of early arrest of the disease should lead to active treatment. Alternate douches of hydrogen peroxide and hot water should be used every few hours. One or two ounces of the former may be thrown into the vagina to be washed away in a few minutes with a hot-water douche.

When the acute symptoms sufficiently subside to permit the introduction of a speculum, the vagina should be carefully cleansed with hydrogen peroxide and its inflamed surfaces kept separate by a light packing with iodoform or aristol gauze. The gauze should be removed the following day. The packing may be preceded by the use of a solution of silver nitrate (½ drachm to the ounce), this application to be made every second to fourth day. The gauze should be removed at the end of twenty-four hours and a douche of a weak solution of lead and opium or solution of ammonium chloride (2 drachms to the pint) used two or three times daily (Collyer). G. D'Aulnoy, in gonorrhœal vaginitis, after cleansing the vagina soaks two or three tampons in a mixture of—Pyoktanin 10 parts, alcohol 15 parts, potash ⅕ part, water 200 parts. This is placed in the posterior vaginal culde-sac and the vulva occluded by a dry pad. This dressing is left in place two days. The pain is greatly lessened. Glycerin tampons are subsequently substituted, which are changed daily. Generally the blue stain disappears upon the fourth day and secretion from this time is absent.

In the chronic forms, cleansing, frequent douching, and the use of astringents must be our dependence. Applications of silver nitrate solution (from 10 grains to 1 drachm to the ounce) may be made by swabbing through a speculum, or in obstinate cases a weaker solution may be used with an atomizer. Insufflation of powders serves to medicate and keep the surfaces separated, as: Iodoform 3 parts, tannic acid 1 part; or, Aristol 4 parts, desiccated alum 1 part. Alum and sugar equal parts are useful. Coition should be discontinued until the disease is cured.

An inflammation of the vagina characterized by absence of rugæ and the presence of a roughened granular surface is seen following the climacteric in those suffering from a rheumatic diathesis or addicted to the use of alcoholic agents.

Constitutional treatment or the correction of the habits of living is generally efficient in affording relief.

Vulvo-vaginitis in young girls presents difficulties in its treatment, yet it is very important that it should be carefully combated. Such cases not infrequently reach puberty with chronic inflammation of the endometrium. The introduction of crayons is extremely painful. Rocaz uses through a soft-rubber catheter a vaginal irrigation of potass. permanganate 1 : 4000, increased in strength to 1 : 1000. At first a slight increase of discharge is noted which soon subsides.

In such cases Richard Pott would first remove every vestige of the hymen and then use small bougies of iodoform 5 to 8 cm. in length.

Vaginismus is so frequently associated with fissures about the posterior commissure of the vulva and is so painful as to fully entitle it to consideration under the division of inflammation. Its presence should indicate a careful examination for fissures of the vaginal and anal orifices. Occasionally points of hyperæsthesia will be found upon the sides of the vagina, to which the touch of a small brush causes agony. Such points should be removed with the knife or scissors. Muscular spasm due to the presence of fissures of vagina or anus may be overcome by giving an anæsthetic and stretching, and subsequently wearing for an hour or two daily a glass vaginal plug.

Vaginal suppositories of opium, belladonna, or iodoform may be found useful. The vulva and vaginal introitus may be painted with a 5 per cent. solution of cocaine before coitus.

Lutaud advises irrigation with potass. chlorat. et tr. opii, āā. 200 parts; aquæ picis, 200 parts—a tablespoonful to a quart of water—to be followed at night by the following bougie:

℞. Cocainæ hydrochlorat.,	gr. iv (0.2);
Ext. belladonnæ,	gr. ij (0.1);
Strontii bromidi,	gr. iv (0.2);
Olei theobromæ,	ʒij (8.0).—M.

Inflammation of the Uterus.

Probably no organ of the body affords greater difficulty in determining the presence of inflammation and its classification, than is experienced in the study of diseases of the uterus. Hæmorrhage and leucorrhœa, symptoms of inflammation, are not infrequently consequent to various constitutional conditions.

Leucorrhœa is frequent in constitutional conditions, as tuberculosis, syphilis, rheumatism, gout, anæmia, and chlorosis. It is quite as likely to occur as nasal or pharyngeal catarrh. Uterine hæmorrhage is a frequent symptom in the exanthemata, in malaria, in lesions of the heart, liver, and kidneys, in irritation or inflammation in the

neighboring organs, as the tubes, ovaries, peritoneum, bladder, and rectum.

It is very difficult to present a classification which will satisfactorily cover symptoms and pathological changes. Pozzi's seems most acceptable, which is *acute* and *chronic* metritis—the latter divided into hæmorrhagic, catarrhal, and chronic painful.

Divisions are frequently made into cervical and corporeal inflammations, but as it is exceedingly rare to find the one without the other it seems an unnecessary arrangement.

Causes of inflammation may be divided into constitutional and local; the former by influencing the uterine circulation render the organ more assailable. The conditions which have already been named as producing leucorrhœa and hæmorrhage may justly be classed as constitutional causes of inflammation. Habits of living, mental impressions secured through erotic reading or conversation, frequent sexual excitement, inordinate sexual intercourse, and masturbation are additional causes. The most frequent cause is septic infection following abortion or parturition, either from the introduction of sepsis or the retention of decidua, clots, or portions of placenta.

Sepsis may occur in the non-puerperal from want of care in manual and instrumental procedures. Next to sepsis in its baneful influence must be placed gonorrhœa. A local cause of inflammation which may be classed among the predisposing is uterine displacement.

Treatment.—Pozzi justly urges the advantage of *prophylaxis* in the treatment of uterine inflammations, and urges that when there is reason to fear that portions of membrane or placenta have been left in the uterine cavity no time should be lost in their complete removal: we should not await hæmorrhage, for the mucous membrane may then be already infected. He advises the dull Récamier curette and weak sublimate injections.

The treatment may be divided into constitutional and local. The former may be to some extent proper to all forms of inflammation. Violent exercise, over-fatigue, and the sexual relation must be avoided. The healthy action of the alimentary canal must be promoted. Constipation should be overcome so far as possible by the use of food (Graham bread, vegetables, prunes, and figs), mild laxatives (mineral water), and enemata, to which glycerin should be added. An enema of a tablespoonful of pure glycerin, or a glycerin suppository, will frequently be sufficient. The daily evacuation of the bowels should be a matter of habit. This can be promoted by eating a dozen each of almonds and raisins at night and taking a glass of water before breakfast, the use of a teaspoonful of bran in water before breakfast, or with some patients a teaspoonful of white mustard in water before meals.

The long-continued use of drastic purgatives should be avoided, but it is so important to unload the lower bowel that resort to them must at times be made. The following prescription accomplishes the purpose, while at the same time it helps to overcome the disposition to constipation:

℞. Aloin., gr. iv (0.2);
Ext. cascar. sagrad., gr. viij (0.6);
Ext. belladonn.,
Ext. nuc. vom., āā. gr. iij (0.15).
M. et ft. capsul. No. viij.
S. One capsule at night as needed.

The general condition of the patient must be promoted by suitable tonics. Any special diathesis, as the rheumatic, should be combated.

The mineral waters are of value; in anæmic patients the ferruginous, sulphur, or arsenical should be advised. Springs charged with chloride of sodium are of special advantage in scrofulous and lymphatic patients, but are of still greater advantage in all visceral engorgements.

Acute Metritis.—Rest in bed must absolutely be demanded, a light, readily digested diet given, and saline laxatives administered. An ice-bag or hot fomentations, according to which affords the most comfort, should be applied over the abdomen. Hot vaginal douches (110° to 120° F.) of large quantities of water are of service. Bloodletting may be employed with advantage. The cervix is exposed by a speculum, cleansed, and a number of punctures made with a spear-shaped scarificator, a bistoury, or a needle. The bloodletting may be followed by a pad of iodoform gauze or with a tampon saturated with glycerin.

The glycerin has an affinity for the watery portions of the blood and exercises a hydragogue effect by unloading the engorged vessels. Barbour prefers a 10 per cent. solution of ichthyol in glycerin. If the tenderness is so marked that the tampon is not well borne, he uses an ichthyol suppository. Exfoliative metritis, known as membranous dysmenorrhœa, should be regarded as indicating the use of the curette. If it is associated with contraction of the cervix, the curette should be preceded by dilatation and followed by painting the cavity with a strong solution of iodine. For acute gonorrhœal metritis Pozzi uses the curette, followed by intra-uterine cauterization with strong chloride of zinc by means of cotton rolled on probes. Gonorrhœal arthritis has been known to follow such treatment.

Catarrhal Metritis.—Chloro-anæmia is an early symptom, so constitutional measures must be employed to supplement local treat-

ment. Thorough antisepsis of the vagina is important. The measures employed to secure it will have a beneficial influence upon the uterus, and especially the cervix, which is generally the part most affected. Douches, sublimate (1:3000), carbolic acid (1:50), at a temperature of 115° F., may be frequently repeated. The former should not be continued for too long a time for fear of poisoning. In severe cases, the treatment to be effective must attack the cavity of the uterus, and may be by antisepsis, cauterization, or curettement, or a combination of all. The uterine cavity may be irrigated with a weak antiseptic solution through a double catheter. If the instrument is not readily introduced, it may be preceded by a laminaria tent or the use of an Ellinger dilator.

Any severe application to the uterine cavity should be preceded by extensive dilatation of the cervical canal, preferably with dilators. A set of Pratt's sounds with a central handle and a bougie on either end are very efficient. The direction of the canal should be known and care exercised to avoid puncture. Dilatation should be followed by curettement with a sharp curette the handle of which is hollow to permit of irrigation to wash away the débris as the curettement is done. This procedure may be followed by swabbing or injecting with tincture of iodine, a solution of the perchloride of iron, a strong solution of zinc chloride, silver nitrate, creasote, or carbolic acid. After application of any of these remedies the superfluous fluid should be removed by irrigation and the cavity lightly packed with iodoform gauze. The gauze as a tampon decreases hæmorrhage, favors closing up the vessels by plastic exudate, increases the activity of the circulation, by its presence as a foreign body promotes uterine contraction, and through its capillary action serves as a drain. It should be removed at the end of three days, and may be renewed after irrigation of the uterine cavity, or the patient may subsequently be treated by vaginal irrigation.

This treatment should be followed by no elevation of temperature; should it occur the gauze should be removed and intra-uterine irrigation at once given. If the external os is small, a crucial incision should be made prior to the dilatation, otherwise it will contract and again interfere with free drainage, which it is exceedingly important should be maintained.

Snegiroff advocates the use of steam, at a temperature of 100° C., in the treatment of endometritis. It produces cicatricial cauterization in the mucous membrane and when prolonged gives rise to a burn. In chronic catarrhal endometritis, he says, this procedure should be applied energetically. The apparatus consists of a receiver warmed with an alcohol lamp, provided with a thermometer. Steam passes from the receiver through a rubber tube into which is fastened a

metallic tube through which the steam enters the uterine cavity. The membrane that surrounds the external os becomes white very rapidly. Afterward about a teaspoonful of brownish fluid similar in appearance to meat-juice exudes from the neck of the uterus, and the vagina is dressed with iodoform.

Chase of Brooklyn, as a local application uses iodoform, glycerin, and iodine in equal quantities. He says that probably one of the best agents is a few drops of iodine and glycerin in equal quantities: iodine is antiseptic, stimulating, alterative, and promotes absorption. Another valuable remedy is aristol dissolved in 10 per cent. solution of albolene. He asserts the danger in the use of instruments is not so much from traumatism as from sepsis. Sponge tents should never be used, as they involve a great risk of injury to the cervical tissues and to septic infection. Any abrasion of the cervical tissue should be touched with pure carbolic acid.

The treatment of hæmorrhagic metritis may be divided into palliative, for relief of the bleeding, and curative. The patient should be kept absolutely at rest, prolonged vaginal injections of hot water given; ergot is of but little advantage; it may be given with more advantage in combination with hamamelis and cinnamon as follows:

℞. Ext. ergot fl., f℥j (30.0);
Ext. hamamelis fl.,
Tr. cinnamoni, āā. f℥ss (15.0).—M.
S. A teaspoonful may be taken every two or three hours.

Fluid extract of hydrastis is sometimes efficient in 20-drop to drachm doses. Falk recommended, and Czempin has given, hydrastin, the active principle of hydrastis, in $\frac{1}{4}$-grain doses every six hours with marked benefit. Dilatation of the cervix or the use of a laminaria tent will stop the bleeding temporarily; more effective would be packing the cervical canal with iodoform gauze. The latter is more effective than vaginal tampons, and the gauze packing exercises a direct influence upon the diseased mucous membrane. In persistent and obstinate bleeding, the uterine arteries may be ligated by passing a ligature through the lateral vaginal fornices without incision, or better, with an incision, passing the ligature so as to secure the uterine arteries. The best hæmostatic, at the same time curative in character, is the use of the curette. It should be used as soon as possible, followed by injection of perchloride of iron, and the cavity irrigated. In rare cases we have hæmorrhage of so persistent a character that it is necessary to resort to either the removal of the ovaries and thus the establishment of the artificial menopause, or do a vaginal hysterectomy to remove the source from which the bleeding occurs.

In chronic painful metritis the use of local bleeding, scarification, and puncture is followed by a coat of tincture of iodine and a glycerin tampon. Tampons may remain four or five days if a little iodoform has been added. Hot douches are of value, particularly where complicated by perimetritis. Massage is a very efficient agent in treatment of such cases, particularly when the uterus is fixed by perimetritic adhesions. In cases in which the cervix is very painful, causing distress in sitting and walking, much relief can be afforded by amputation of the cervix. The removal of a portion of tissue, the rest in bed, the alterative changes which take place, will result in decrease in the size of the uterus and the unpleasant symptoms are not infrequently entirely removed. This amputation should be done with a knife or scissors and the parts accurately brought into apposition so that the least amount of cicatricial tissue will result. Where the inflammation is complicated by extensive laceration of the cervix, with eversion of the lips, and a plastic exudate fills up the fissures, the best method of procedure will be to either amputate the cervix or remove the indurated tissue, freshen the edges of the fissure, and unite the surfaces by sutures. In performing this operation it is exceedingly important to so accomplish it that a good broad surface is left for the future os, otherwise contraction of the cervical canal takes place, defective drainage, and the development of diseased conditions extending into the tubes, ovaries, and peritoneal cavity, necessitating a serious and sacrificial operation.

Inflammation of the uterus in some form is common to all ages. It is frequently seen in girls of the ages of twelve to sixteen, when it produces menorrhagia, erosion of the external os, erosion and eversion of the lips, resembling a laceration of the cervix. Adenoid vegetations are found in the cervical canal (Mundé). The hypertrophic mucous membrane should be excised, the endometrium curetted, and if eversion is marked, the edges of the lips pared and sutured.

Senile Endometritis.—In the aged a muco-purulent discharge often follows the climacteric, which causes erosion of the lips of the cervix and the vault of the vagina. This condition may follow operations to artificially establish the menopause. It is usually readily cured by the use of a solution of silver nitrate ($\frac{1}{2}$ to 1 drachm to the ounce). The use of the curette followed by the solution just named or one of chloride of zinc is advisable.

Inflammation of the Uterine Appendages and of the Peritoneum.

The existence of inflammation in a Fallopian tube does not necessarily indicate the presence of coexisting trouble in the corresponding ovary, surrounding peritoneum, or the reverse, but they are

so frequently associated that it seems more convenient to consider them together. Inflammation extends from the uterus to the pelvic structures in one of three ways: first and most frequently, by the continuous surface lining uterus and tubes; second, through the blood-vessels; third, by the lymphatics. The extent of involvement, and the destructive influence of the disease are dependent upon the activity of the infecting poison and the degree of resistance of the tissues of the infected individual. Infection and disease of the pelvic structures may occur without infection from the uterus being responsible, as through the intestinal canal, and more rarely the urinary tract may present the avenue by which it finds entrance. Disease of the right tube and ovary are not rare occurrences from infection by a diseased vermiform appendix.

Treatment necessarily depends upon the character and extent of involvement. Our constant aim should be the preservation of life and restoration to health with the least possible sacrifice of organs and disturbance of their functions. To accomplish this we must be on the alert and ready to attack the encroachments of disease promptly and boldly.

Acute inflammations of the pelvis should be combated by rest, saline laxatives, hot vaginal and rectal douches, the continuous use of the ice-bag over the abdomen, early uterine curettement and gauze-packing, prompt incision and drainage of the broad ligament or retro-uterine cul-de-sac (Henrotin), breaking up exudate or adhesions, packing with gauze in order to afford pelvic drainage. The uterine gauze may be removed in forty-eight to seventy-two hours; that from the pelvis in ten days (Pryor).

The early application of this treatment may anticipate and avoid suppuration. The resulting adhesions and fixation may subsequently be overcome by the judicious exercise of pelvic massage and the use of glycerin tampons. Non-suppurative inflammation with fixation of the pelvic organs may be similarly treated, or by breaking up adhesions by means of a free incision through the posterior vaginal fornix.

Retro-uterine adhesions and those binding down the ovaries and tubes may thus be separated. Such a procedure is far more rational than that suggested by Schultze to drag the rectum from the posterior surface of the uterus by introducing two fingers into the former organ, or that of Sims to drag away the uterus by the introduction into its canal of a bougie. Neither procedure affords an opportunity to discover the extent of, nor the means to combat, a resulting injury.

Extension of inflammation into the tube produces a salpingitis, perisalpingitis, a sealing up of its abdominal end, a collection of serum and a resulting hydrosalpinx; the formation of pus, a pyosalpinx,

or extravasation of blood, or even hæmorrhage, a hæmatosalpinx, according to the virulence of the poison and resistance or want of resistance in the infected individual. The ovaries may be infected by direct passage of septic germs into an ovary rendered vulnerable by a recent rupture of its Graafian follicle or the pressure of a corpus luteum, or an infected tube, becoming adherent to a cystic ovary; subsequently through pressure-absorption a communication may be caused between them and thus cause a tubo-ovarian abscess. Tubal or tubo-ovarian cysts may be comparatively free from adhesions or be firmly fixed. Purulent collections are generally associated with extensive pelvic inflammation. Large collections generally result in rupture of the tube and the formation of an abscess in the broad ligament, or the pus may be encysted in the retro-uterine space.

It should be well understood that not every case of pelvic inflammation demands operative procedure. In rest, saline purgatives, hot douches, glycerin tampons, counter-irritants, and pelvic massage we have measures capable of restoring many such patients.

The existence of the severer forms of pelvic trouble does not absolutely demand sacrificial operations. As has already been suggested, early resort to vaginal incision and drainage may prevent suppuration, and abort a threatened severe and destructive inflammation.

With the advent of suppuration, Nature endeavors to bar the way to infection of the general peritoneal cavity by plastic exudate, which glues together the viscera. To operate upon a large pus-collection by abdominal incision means that the guards which Nature has so laboriously provided shall be effaced, that the general peritoneum shall be soiled by the removal through it of the pelvic pus. It would seem the wiser course to secure evacuation through the vagina. In some cases this will be found comparatively easy, as the collection, where it is encysted in the posterior cul-de-sac, may impinge upon the vagina, or it has filled up the broad ligament. In other cases it may require considerable dissection between the folds of the broad ligament, pushing to one side ureter and uterine artery. In all drainage operations it is important that no mere tapping of the collection, but a free incision shall be made. Conservation of function and structure has been announced as the guiding principle of the modern surgeon in the treatment of pelvic inflammation. But in cases in which the destructive influences have rendered the retention of the ovaries and tubes inconsistent with restoration to health, the question arises, What shall be done with the uterus?—the organ in which the infection developed and from which it extended—an organ whose functions are secondary to those of the ovaries, and in which changes are produced by the pathological process which will render it a source

of numerous local and reflex phenomena following the artificial menopause induced by the removal of the appendages.

Removal of the Uterus.

The recognition of these secondary manifestations led Baldy to advocate the supravaginal removal of the uterus in abdominal section wherever the destructive process required the removal of both ovaries. The relief of some neurotic phenomena by removal of uteri *per vaginam*, in cases in which the appendages had been previously removed through the abdomen, induced Péan to advocate what he calls uterine castration wherever both ovaries and tubes are irreparably diseased.

Both parties appreciated the baneful influence produced by retention of a subsequently useless organ which had been the original source of infection, but the course of procedure was very opposite. For the *abdominal* operation it is claimed, first, that the field of disease is more accessible; second, that a more complete operation can be accomplished because sight and touch can both be exercised; third, that it enables the operator to retain the cervix to help round out the vagina; fourth, that the peritoneal cavity can be closed, decreasing the possibility of hæmorrhage and infection; fifth, that the danger of injury to the ureter, bladder, or intestine is less, and when produced is more readily repaired. The advocates of the *vaginal* procedure, claim, first, that it permits of exploration and evacuation of pus-cavities before the peritoneal cavity is opened, thus decreasing the danger of peritoneal infection; second, that uterus, ovaries, and tubes can be easily removed, and with less disturbance of intestinal adhesions; third, that drainage is with and not against gravity, and from the most dependent part of the abdominal cavity; fourth, that with careful procedure no necessity exists for more danger of injury to bladder, ureter, or intestine than in the abdominal procedure; fifth, there is no danger of such unpleasant sequelæ as abdominal fistulæ and ventral herniæ; sixth, convalescence is more rapid.

It cannot be denied that both procedures have a place: while the vaginal route decreases the frequent necessity for the abdominal procedure, it should not always supplant it. The indications for each procedure in inflammatory diseases may be briefly stated as follows: The abdominal operation should be preferred, first, in unilateral disease of the appendages where the mass is comparatively free and does not encroach upon the lateral or posterior vaginal fornix; second, in bilateral disease of long standing where uterus and appendages are firmly fixed, without any indication of large pus-collection. The vaginal may be judiciously elected, first, where either large unilateral or bilateral collections of pus evidently impinge upon the vaginal

walls, whether they be situated posteriorly or laterally; second, where bilateral disease so profound in character exists as to demand the removal of both ovaries and tubes. In weak, debilitated patients suffering from large collections of pus, the choice of the vaginal route does not necessitate the performance of a radical operation. The condition of the patient may demand a palliative operation. The heavy load of infection is evacuated by a simple operation and with but slight danger to the patient. After the patient has had a chance to recuperate her weakened vital forces a radical operation may be done, through the vagina or by abdominal section as may seem best adapted to the individual case.

The removal of the uterus through an abdominal incision may be complete or partial. The latter is more frequently practised. The procedure is performed as follows: After the ordinary preparation an incision three or four inches long in the median line is made, the ovaries and tubes separated and brought out, using an aspirator to remove pus-collections, and carefully guarding the viscera and wound-surfaces with gauze packing to prevent soiling from rupture of an abscess. A ligature is introduced through the broad ligament and tied external to the tube and ovary. The ligament is cut between the ligature and a pair of forceps placed next to the uterus. The opposite ligament is treated in a similar manner. If properly introduced, these ligatures have controlled the ovarian arteries. A peritoneal flap is now turned down from the anterior uterine surface, and with it the bladder. One end of the ligature is carried through the base of the ligament, and when tied secures the uterine artery, first upon one side and then upon the other. The cervix can now be cut through, removing the major part of the uterus without fear of hæmorrhage. Should any bleeding occur, the ligatures may be again introduced to secure an additional section of the broad ligament. The use of a continuous ligature gathers the ligament up, and renders the entire surface more easily covered with peritoneum (Goffe).

In amputating the uterus, care has been exercised to leave a short flap upon the posterior surface. By a continuous suture of fine silk or catgut the peritoneal flaps are covered over the stump, rendering the operation a retro-peritoneal one. Having determined that hæmorrhage is controlled and the pelvis clean, the wound in the abdomen is closed.

Hysterectomy complete is performed in a similar manner, excepting that instead of cutting through the cervix an incision is made into the vagina posteriorly and the cervix closely hugged with scissors until the entire organ is removed; any branches of the vaginal artery or unsecured portion of the uterine artery may be ligated separately or in mass. The peritoneum may be closed as before, previously

taking the precaution to pack lightly the raw surface below it with iodoform gauze.

Vaginal Hysterectomy.—In the removal of the uterus by the vaginal route we may employ either the ligature or the clamp. The convalescence and subsequent progress of the case will be more satisfactory with the latter. It is exceedingly difficult to prevent ligatures from becoming infected, and when infection occurs the patient will have a discharge until the ligatures come away. The use of the clamp greatly expedites the operation. The instruments required are four wide and one narrow-bladed retractors, three double tenacula, a knife, scissors, six clamp forceps, a dozen hæmostatic forceps, and a thermo-cautery. After exposure with the retractors the cervix is seized with a tenaculum, drawn down, and the vagina separated from the cervix by the thermo-cautery knife. The vagina and bladder are pushed off anteriorly and the vagina posteriorly until the peritoneum is reached. The latter can be more readily determined anteriorly by elevating the vagina and bladder by a retractor, while traction downward and backward is made upon the cervix. The peritoneum behind the uterus is opened and the surface explored, when adhesions may be carefully separated as high as the fundus, particularly if the organ is retro-displaced. When the organ is non-adherent the anterior peritoneum may be opened at once, and the uterus will then be retained only by the broad ligaments. The inferior portion of each ligament is secured by a pair of clamp forceps and cut between them and the cervix. The latter is amputated at the level of the upper end of the forceps; before the amputation is complete, the anterior margin of the remaining portion of the uterus is secured by a double tenaculum. Traction upon this rotates the uterus forward through the anterior opening, when the fundus can be seized and the organ be completely inverted. The amputation of the cervix permits this to be accomplished through a smaller arc. The presence of adhesions may have prevented the early entrance of the anterior cul-de-sac; the amputation of the cervix and dragging forward of the uterus permits this to be safely and expeditiously accomplished. Adhesions may be separated, under the sight, at the expense of the uterine structure when close and firm. The eversion of the fundus and separation of adhesions permit the exploration and separation of the left tube and ovary, after which a clamp forceps may be applied upon the upper part of the ligament, securing the ovarian artery; cutting the ligament between the forceps and uterus permits the latter to be held by the one side. The right ovary and tube are now brought down, the ligament secured with forceps, and the uterus removed. The separation of the ovary and tube occasionally may not be so readily accomplished. To afford additional room in such cases the upper part of the ligament may be

secured with smaller forceps, the uterus removed, and the ovary and tube then enucleated. As the appendage is drawn out a large forceps on either side is made to replace the smaller instruments. In rare cases the tubes and ovaries will be so firmly fixed as to preclude their removal, when they should be torn open and carefully packed. After completion of the removal, careful inspection should be made for hæmorrhage, the vagina and pelvis irrigated with hot salt solution, and the cavity packed. The gauze should be carried over the ends of the clamp forceps to prevent their injuring coils of intestine. The dressing is completed by covering the external ends of the forceps with gauze and cotton to prevent their being a means for entrance of pathogenic bacteria. This dressing should be changed as frequently as it becomes soiled.

The clamps are removed at the end of forty-eight hours, the gauze in four to six days. A few hours subsequent to the removal of the gauze a vaginal injection should be given, and repeated twice daily, or oftener, according to the amount and character of the discharge. The sloughing of the tissue included in the grasp of the clamps will produce some odor. The latter may be lessened or removed by douches of sulphurous acid (1 : 30), electrozone, a strong chlorinated water (1 : 4), or a 10 per cent. solution of the lactate of silver. The patient may be permitted to leave her bed at the end of ten days to two weeks.

Inflammation of the Ovaries.

Inflammation of the ovaries is called peri-oöphoritis when it affects the periphery, and oöphoritis when the structure of the organ is involved. It is also divided into acute and chronic. These conditions do not exist alone, but are a part of a more general disease.

Inflammation of the peritoneum called perimetritis involves, with the other pelvic organs, the surface of the ovary, causing adhesions slight in character, forming firm bands, or so extensive as to bury the ovary so that it can be discovered only by enucleation. The more acute forms of inflammation are associated with general sepsis. The ovary in pregnancy is particularly vulnerable. Its larger corpus luteum is easily infected. The writer has seen the ovary infected, resulting in an abscess, without any apparent involvement of the tube. That the tube was the avenue for infection was evident from the presence of a portion of lymph upon the side of the ovary, and another of similar character in the tubal ostium. The disease may undergo resolution or may result in chronic inflammation or the formation of an abscess.

The treatment consists in rest, depletion by saline purgatives, application of the ice-bag, or, where the latter is badly borne, hot applications. Continuous high temperature associated with pelvic symptoms should be regarded as an indication for removal of the diseased organ.

The chronic forms should be combated by judicious measures. The relief of pelvic congestion, the exercise of counter-irritation, and administration of alterative remedies may obviate the necessity for operative interference.

The existence of such conditions should not be regarded as demanding an abdominal section. When displaced, the ovary should be pushed up and supported by tampons or a suitable pessary. The patient should be cautioned against lying on her back. Where the organs as a result of disease are enlarged, painful and sensitive, and the general health is breaking down, an incision should be made. This need not be done through the abdomen, but by way of the vagina. The operation, known as "anterior colpotomy," has been largely practised by Martin of Berlin. An incision is made through the anterior fornix of the vagina, pushing off the bladder until the peritoneum is reached and opened. The ovaries are easily drawn through into the vagina, excised, resected, or punctured as their condition may demand.

Cystic ovary is a consequent of chronic inflammation; the resulting hardening of the tunica albuginea causes it to rupture before the matured follicle with difficulty or not at all. A number of such cysts may be found in an ovary, producing so much hyperæmia of the pelvis as to lead to intractable uterine hæmorrhage. The latter symptom may be so marked and persistent as to demand the removal of the ovaries.

Tubercular inflammation, occurring in either tube or ovary, should be regarded as an indication for prompt excision of the offending structures. Complicated by extensive pulmonary involvement or destruction, any operative procedure must be considered of doubtful expediency, if not absolutely contraindicated. A judicious *conservatism* in the surgery of the pelvis will lead the operator to preserve organs whole or in part wherever opportunity affords. Human nature is so constituted that we prize in the highest degree that which is lost. Many apparently seriously diseased organs may be saved or restored to functional usefulness. The separation of adhesions will set free a healthy but otherwise worthless tube. Gersuny recently opened the abdominal end of a Fallopian tube which contained a large quantity of fluid blood and fixed in it the adjacent ovary. The woman, who had been sterile through a five months' marriage, conceived in two months.

Pelvic Cellulitis and Peritonitis.

Pelvic Cellulitis.—The cellular tissue about the uterus, and in the broad ligaments, is particularly prone to inflammation as a result of sepsis. The infection may enter through the wounds of the peri-

neum, vagina, or walls of the uterus. The lymphatics are generally the conveyers, consequently there is lymphangitis, and without doubt inflammation, and not infrequently suppuration of the lymphatic glands.

In the treatment must be considered rest, the maintenance of nutrition, the use of tonics, application of cold or heat, early incision, and drainage where the involved structures are accessible.

Pelvic peritonitis is much more frequent, and may result from an extension of septic or gonorrhœal infection through the uterus and tube. Inflammation in the latter leads to occlusion of its abdominal end, when the peritonitis may be in the form of a perisalpingitis, or the inflammation may extend through the uterine walls. While the source of infection is generally uterine, it may result from infection through the intestine, from bruising of the rectum during labor, from the vermiform appendix, from the rupture of a tubal-gestation sac, and the escape of blood into the peritoneal cavity. Such a collection may become encysted.

The inflammation may be confined to the pelvis or become general. The suffering is more intense than in cellulitis, so that it may be necessary to ameliorate the distress by opium or morphine. The main dependence should be upon the frequent administration of salines until purgation is produced, thus depleting the congested peritoneum. The use of the ice-bag affords great relief. Early resort should be made to surgical procedure. The proper means must be adapted to the particular condition and has been discussed under the various operations already given.

Inflammation of the Urinary Tract.

Urethritis.—Inflammation of the urethra is generally associated with cystitis, of which it may be either resultant or cause. It may be produced by gonorrhœal infection or from traumatism—as from the use of the catheter. A painful form of urethritis is produced by the presence of a fissured or excoriated condition of the internal meatus.

The opportunities for the production of urethritis and cystitis through the use of the catheter are so frequent, the subsequent symptoms so marked, and the condition so obstinate, that it seems wise to consider the necessary precautions to adopt in catheterization in order to prevent its production. With the exercise of the *greatest care*, the frequent and long-continued use of the catheter is likely to cause an irritable condition of the urethra. The trouble is most frequently produced by want of cleanliness, for which the old method of introduction of the catheter by touch is mainly responsible. The catheter, the hands of the operator, and the vulva should be clean,

conditions which are incompatible with the practice of introducing the instrument without exercising the sense of sight. A glass catheter is the preferable instrument, as we can better see that it is clean. It may be boiled before using, or be kept during the intervals of its use in an antiseptic solution and scalded just before its introduction. Its surface should be anointed with sterile vaseline. The vulva and vestibule should be sponged with a warm antiseptic solution, the labia separated, exposing the external meatus, and the catheter carefully and gently introduced. The finger is held over the orifice of the instrument until a receptacle can be placed beneath it. After the urine ceases to flow the finger should again be placed over the orifice of the instrument before its withdrawal. This precaution retains the urine in the catheter and prevents the soiling of the external parts with urine.

Despite the precaution just given, urethritis is frequent from catheterization, hence wherever possible the patient should be permitted to void her urine without assistance.

The presence of urethritis may be combated by injections of (1 to 5 grains to the ounce) solutions of silver nitrate, zinc sulphate (2 to 6 grains to the ounce of distilled water), to which may be added $\frac{1}{2}$ fluidrachm of ext. hydrastis; zinc chloride 1 per cent. solution may be of advantage.

Gommaerts advocates a 5 per cent. solution of aluminol; Villetti a 2 per cent. solution of ichthyol, five to six times daily, which is gradually increased to 5 per cent.

In long-continued disease, especially when complicated by a fissured condition of the internal meatus, the promptest and most effectual relief is obtained by forcible dilatation of the urethra.

Cystitis is produced by gonorrhœa, extension of urethritis, infection from dirty instruments, from exposure to cold, and from overdistention of the bladder. When a large quantity of urine has been retained, the mucous membrane becomes anæmic from the great pressure. The complete evacuation of such a bladder would result in a sudden hyperæmia of its mucous membrane, which causes violent inflammation. Not unfrequently such cases will shed the entire mucous membrane, either in shreds or as a complete cast of the bladder. Cystitis is sometimes simulated by functional diseases of the bladder. In the former the urine will be cloudy, filled with mucus, phosphates, shreds of tissue, epithelial cells, and blood- and pus-corpuscles; in the latter it is generally clear.

The treatment consists in keeping the urine bland and non-irritating by a carefully regulated diet. All acid articles and highly seasoned foods should be excluded. In severe cases an exclusive milk diet should be advised. Large draughts of saline or ferruginous water

should be given. Such remedies should be administered as will render the urine alkaline or non-irritating. The bromides will often give relief. A very efficient prescription is:

℞. Ammon. benzoat., ʒiij (12.0);
Tr. hyoscyami, fʒiss (6.0);
Ext. buchu, āā. ʒij (60.0).—M.
Sig. A teaspoonful in water four times daily.

The bowels should be freely moved daily. Locally the bladder should be kept clean by irrigation through a double catheter with large quantities of hot normal salt solution, or some of the various local remedies which were advised for urethritis.

In obstinate cases the urethra should be dilated and the interior of the bladder carefully examined with the endoscope or urethral speculum. Local patches of abraded mucous membrane, ulceration, or papillary growths may be recognized and be treated locally. Silver nitrate (1 drachm to the ounce) applied on a small piece of cotton is efficient. The bladder should be immediately filled with a salt solution to neutralize the silver.

The patient may be placed under an anæsthetic for the necessary dilatation, or where the speculum has been previously used it may be reintroduced by previously swabbing the urethra with a 10 per cent. solution of cocaine. Mann has directed attention to the fact that a cystitis is often kept up by an attack of severe ureteritis. In such cases the orifices of the ureters will be noticed to be prominent and excoriated.

Edward Reynolds says that no diagnosis can be considered satisfactory unless the bladder is well dilated; when the dilatation is small, systematic inspection is prevented by the limitation of the field of vision. Small folds exist which are capable of hiding small lesions, and the trigonum is obscured by a small layer of urine.

He inserts into the urethra a pledget of absorbent cotton saturated with a 20 per cent. solution of cocaine and then dilates it to admit a No. 13 or 14 cystoscope. This is repeated at one or two more visits, after which a No. 12 cystoscope can be passed without pain. The knee-chest position affords the best dilatation of the bladder, but the trigonum is difficult of access and the position is uncomfortable for the patient. The position advocated by Kelly, in which the pelvis is elevated, is more comfortable, exposes the trigonum better, but affords less dilatation. The urine is more in the way. The Sims position is more comfortable for the patient, and midway between the positions already considered in the amount of dilatation and inconvenience experienced from the urine. The patient should be placed first upon one

side and then upon the other, in order that the entire field shall be exposed. The anterior vesical wall is difficult if not impossible to fully expose, but it is rarely the seat of exclusive disease. The trigonum is generally the part most seriously affected.

Ureteritis.—This condition is characterized by the symptoms of cystitis, with pain extending toward the corresponding kidney. By vaginal examination (Kelly) the ureter can be felt like thickened cord and extremely tender. It is palpated by placing the finger behind the cervix and drawing it forward, when the ureter will be felt to roll under the finger. Kelly has advised a linen woven catheter by which the ureter can be explored and irrigated. In addition to affording facility for treatment of disease of the ureter, it is valuable in determining the condition of each kidney, its activity and the character of its secretion. The procedure affords an opportunity to carry the treatment to the pelvis of the kidney. For inspection and treatment of the bladder and ureters Kelly suggests the following instruments: a female catheter, several urethral dilators, a series of specula with obturators, a common head-mirror and lamp, argand burner, or electric light, long delicate mouse-toothed forceps, suction apparatus for completely emptying the bladder, a ureteral searcher, ureteral catheter without handle, and several bran-bags or an inclined plane for elevating the pelvis. For a first examination the patient is given an anæsthetic. The bladder is emptied by a catheter. The urethra should be dilated with graduated bougies, up to 12 mm., which can be accomplished with a but slight external rupture. A speculum of the same size is introduced and its obturator removed. The patient's hips are elevated upon cushions or an inclined plane to the height of 20 to 40 cm. (10 to 12 in.) above the table. Light is reflected into the speculum by a mirror from an argand lamp. Where the latter cannot be secured, a candle can be made to serve the purpose. The introduction of the speculum in this position leads to the bladder being ballooned by the entrance of air.

All parts of the bladder may be inspected by moving the speculum in different directions. By elevating the handle of the speculum the base of the bladder and the inter-ureteric ligament is exposed. Turning the speculum 30° to one or the other side, the orifice of the ureter is observed as a dimple, a little pit, in inflammatory cases as a round hole in a cushioned eminence, or as a V with its point directed outward. It may be seen to discharge urine in spirts, or give exit to pus or blood. The surface should be carefully sponged with a hot boric acid solution before the introduction of the catheter. The catheter may be left in place for an hour or more. The urine which accumulates in the bladder necessarily represents the other kidney. In this way the kidneys may be isolated and the secretion of both studied through the

introduction of the one instrument. With the long catheter the entire ureter can be explored and the pelvis of the kidney irrigated.

MALFORMATIONS, TRAUMATISMS, AND OBSTETRIC LESIONS.

Malformations of the Genital Organs.

These may be congenital or acquired. Many of these conditions are of interest from a diagnostic standpoint, but present no new phases which entitle them to our consideration.

Atresias and *fistulæ* are of special interest.

Atresia may occur at the hymen, in the vagina, and at either the external or internal os in the uterus. The effect of the lesion will differ according to its situation. Associated with a normal condition of the other organs it may result in retention of the menstrual blood and of mucus in the vagina (hæmato-colpos) or vagina and uterus (hæmato-colpometria) or in large collection the tube may also be distended (hæmato-colpo-metrosalpinx); when the obstruction is situated in the cervix the collection occurs in the uterus and possibly also in the tube.

The danger of sepsis in operation upon such collections formerly led to the advice that the tumor should be opened by a mere puncture and the contents should be permitted to escape drop by drop. The possibility of rupture of a distended tube still leads many to advocate the slow evacuation of the pus-collection. The writer would advocate the evacuation of the collection by a free incision and thorough irrigation of the cavity with a mild antiseptic. The cavity should then be packed with iodoform gauze. The packing should be removed at the end of forty-eight hours. Drainage by rubber tube may follow the removal of the gauze. Subsequently difficulty may be experienced in maintaining the opening. Such an artificial opening, where it occurs in the vagina, may be prevented from closing by directing the patient to wear for a stated period each day a glass plug. Narrowing of a limited portion of the vagina may be remedied by one or two vertical incisions through the stricture to its base, and uniting the surfaces by sutures parallel to the incisions, which will widen the narrowed canal. In atresia of some length, after incision, flaps of mucous membrane may be dissected up and carried through the constricted portion to form a new vaginal canal. In *absent vagina* we have the choice between an operation to form a vagina or the removal of the ovaries, and possibly the uterus, where the latter is filled with

fluid. When we consider the difficulty of maintaining a vagina and the danger following a pregnancy, the latter procedure would seem the more advisable. Collections of fluid in one side of a double uterus or vagina offer difficulties in diagnosis. The treatment does not vary from that already described.

Fistulæ are generally traumatic, resulting from injury during labor. The fistulous openings between the neighboring viscera and the vagina are those between the genital and urinary tracts, four in number, the urethro-vaginal, vesico-vaginal, vesico-uterine, and uretero-vaginal. Those between the genital and intestinal tracts are ano-vaginal, recto-vaginal, and entero-vaginal. The general treatment of fistulæ has been discussed in the earlier volumes. Small fistulæ may be closed by flap-splitting operations. Thus, a trap-door flap may be lifted up, the opening closed by eye-silk or small chromicized catgut, and the flap stitched over it. In large fistulæ a flap-splitting operation will often permit the opening to be closed without any sacrifice of tissue. In very large fistulæ, where a good part of the anterior wall is destroyed, ordinary measures are futile for closing. The traction will be so great that the united tissues tear out. Such a fistula may be closed by transplantation of the bladder-wall (Bardenhauer). The patient is placed in the Trendelenburg posture, suprapubic cystotomy is done, and the bladder-wall dissected from the peritoneum and uterus until the fistula is reached. Adhesions and cicatrices are separated, the edges of the fistula are freshened, pressed together with the finger in the wound, and from the suprapubic opening silver-wire sutures are introduced, bringing them out upon the vaginal side. The catheter should be used every three hours.

A uretero-vaginal fistula may be closed by dissecting up the orifice, turning it into the bladder, and suturing the vaginal surface in such a way as not to compress the ureter. It is probable the more certain plan would be to open the abdomen, pick up the affected ureter and turn it into the bladder, doing what is known as a uretero-vesical anastomosis (Boldt).

Entero-vaginal fistulæ are most effectively closed by abdominal incision. The opening in the intestine closed, the vagina no longer demands consideration.

Traumatisms.—Injuries of the vulva and vagina are obstetrical and non-obstetrical. The latter are less frequent and arise from perforation by falling upon some body, or are injuries of coition. The treatment should be immediate and directed to the relief of the injury.

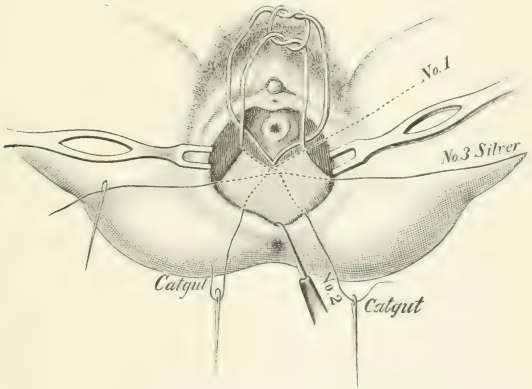
Obstetric Lesions.

Obstetric lesions are generally lacerations of the perineum during the progress of labor. Laceration of the perineum may be very slight

or quite extensive, involving the sphincter ani and the recto-vaginal septum. Where possible, every laceration should be immediately sutured. If the labor has been very long and the vulva is frayed and bruised by repeated and long-continued attempts to deliver with forceps, immediate closure is inadvisable, as the loss of vitality in the tissues will probably cause sloughing of the sutured surfaces, thus endangering the development of sepsis where drainage is obstructed by sutures. In the worst cases, however, an attempt should be made to secure control of the bowel by union of the recto-vaginal septum and of the sphincter ani, leaving the remainder of the perineum to be repaired by a secondary operation. Dr. Watkins, in Volume III. of this SYSTEM, has so accurately described his method of anterior colporrhaphy and the ordinary operations upon the perineum as to leave but little to be added.

Outerbridge modifies Emmett's operation by greatly shortening it. He uses but three sutures to coapt the denuded surfaces (Fig. 33).

FIG. 33.



Outerbridge's operation (*Medical Record*).

The upper suture is medium-sized catgut, ten or twelve inches long, with a needle at either end. One needle is imbedded in the crest and continued along the upper line of the denudation, coming out at the right upper angle in the undenuded tissue. The other is continued in the same manner to the left, coming out at the left upper angle. This suture is not tied, but the needles on either side are thrown over the symphysis temporarily. The next suture is of silver, and the needle is imbedded one-quarter of an inch above the denuded tissue, midway between the upper and lower points of denudation, or, in other words, at the highest point of denudation upon the left side of the labia, and

proceeds from left to right to a corresponding point upon the latter side, being throughout thoroughly imbedded. The upper suture is now tied, care being exercised to approximate the tongue or central portion and the right and left angles. One of the needles of this suture is then passed downward and outward from the central point under the denuded tissue and brought out at one side of the labia, about half an inch above the lower point or angle of denudation; the second needle is passed in a similar manner to the opposite side. This suture should now be tied, exercising care to draw it tightly. This completely closes the lower angle of denudation. The silver wire is next to be twisted. Occasionally one or two superficial sutures will be required.

This operation lifts the posterior wall up against the anterior, is easily done, and does not produce sloughing. But one suture will require removal. The writer, in complete laceration or in those lesions in which the sphincter is weakened, splits up the perineum and brings the surfaces together with No. 00 chromicized catgut, which is introduced as a continuous and buried suture. The first aim is to bring in contact the divided or torn ends of the sphincter ani muscle, and second, to draw into the median line the ends of the ischio-cavernosa muscle. The remaining denuded surfaces are brought together and covered with a row of catgut sutures in the skin. This operation makes no painful traction upon the wound-surfaces and consequently is not attended with much pain. By the use of the chromicized catgut the wound is sure to be kept in contact sufficiently long to secure firm union, while the patient is spared the anxiety regarding the removal of the sutures.

In more or less complete lacerations the operation should be preceded by free purgation, restriction of diet for two days to animal broths, and rest in bed. She should remain in bed for fully two weeks after its performance, be restricted to animal broths for one week, and should not be allowed the use of milk during convalescence. The bowels should be evacuated upon the third day and daily thereafter. The marital relation should not be resumed for six weeks.

Laceration of the Cervix.—The effect of laceration of the cervix will depend upon its extent. The slighter lacerations are of but little moment except as indicating the importance of treating the accompanying endometritis. Such lesions should not be considered as indicating operative procedure, for the decrease in the size of the cervical opening obstructs drainage and increases the danger of extension of disease to the deeper pelvic structures. The deeper lacerations, associated with eversion and hypertrophy of the mucous membrane, call for operative relief. The method of procedure will be dependent upon the complicating inflammatory lesions. A cervix with a deep

unilateral or bilateral tear in which there is but little induration of the lips, or eversion of the mucous membrane, may well be submitted to trachelorrhaphy. In laceration with hypertrophy of one lip, or eversion of hypertrophied mucous membrane, Schroeder's one-flap amputation of the cervix is the preferable procedure. The procedure should be chosen which will best remove the diseased structure and subsequently afford a good cervical canal for vent to its discharges. Dührssen advocates a flap-splitting operation upon the cervix by which the necessary denudation is accomplished without the sacrifice of tissue. Where the laceration extends through the cervix into the cellular tissue, a cicatrix results which draws the cervix toward the affected side. Martin overcomes this displacement by a circular incision upon the side of the uterus. Sutures are introduced parallel to the incision, which correspondingly increases the length of the lateral vaginal fornix. Hæmorrhage following either trachelorrhaphy or amputation of the cervix may be arrested by passing a suture deeply upon the side from which bleeding occurs, so as to obstruct the uterine artery.

DISPLACEMENTS.

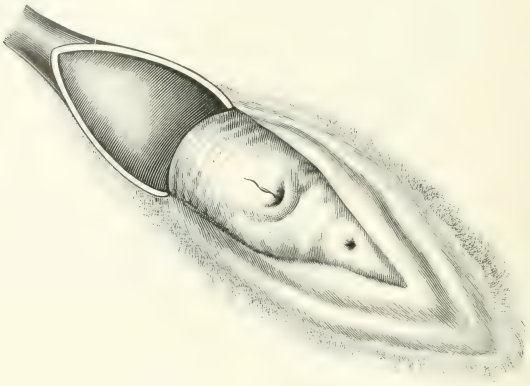
The uterus may be displaced in any direction. The most important displacements are prolapsus, the retro-displacements, and anteflexion. *Anteversion* is a symptom dependent upon any cause which increases the weight of the organ. Its treatment, then, is that which is applicable to its cause.

Anteflexion may be congenital or acquired. The former exists in those cases in which there has been defective development, and the organ retains its puerile form with a cervix disproportionate to the body. The acquired anteflexion results from cold or exposure during menstruation, followed by inflammation; from inflammatory changes subsequent to parturition or abortion; or, from the presence of growths within the uterine walls. The displacement interferes with the proper performance of the functions of the organ, hence dysmenorrhœa and sterility result.

Treatment consists in relief of pelvic congestion, the use of hot vaginal douches and glycerin tampons, regulation of the bowels, and the exercise of proper hygiene. In the less severe forms the uterus may be dilated, curetted, and packed with gauze. The resulting exudation of the walls leads to an improved position and better drainage. If the flexion is situated in the middle or lower cervix, splitting the posterior lip will straighten the canal, afford relief during menstruation, and increase the probability of fecundation. The incision, how-

ever, inclines to close and contract. Dudley advises to split the posterior lip beyond the utero-vaginal attachment (Fig. 34). The sur-

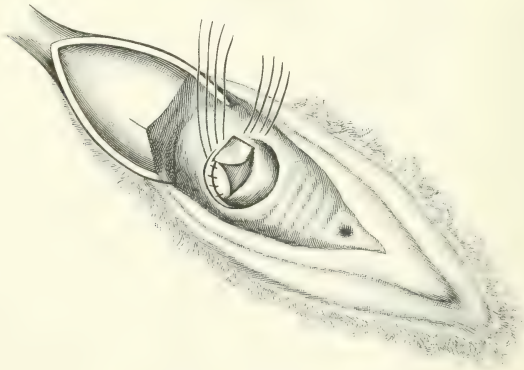
Fig. 34.



(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

faces are held apart by tenacula and the incision deepened, especially upon the cervical side, with the knife. The surfaces are then folded in and (Fig. 35) secured with silkworm-gut sutures, uniting the uter-

Fig. 35.

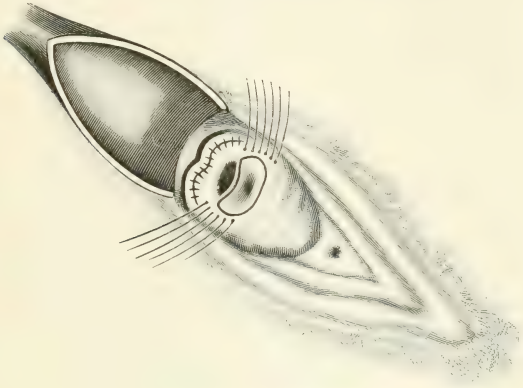


(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

ine and vaginal mucous membranes. The anterior lip of the cervix is amputated (Fig. 36), and closed with transverse sutures which push back the cervical orifice (Fig. 37). In flexion situated in the upper

third of the cervix, Vuillet dissects off the bladder (Fig. 38), makes a vertical incision upon a grooved director (Fig. 39) from above the

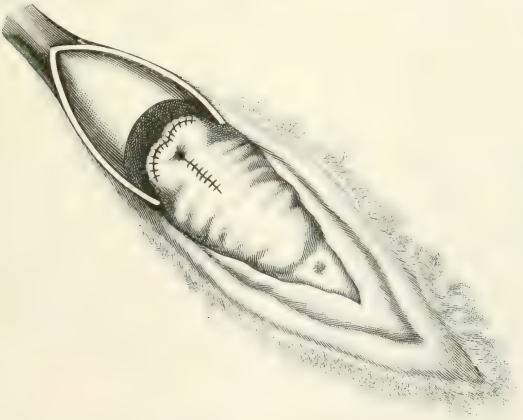
FIG. 36.



(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

point of flexion to the intervaginal portion of the cervix (Fig. 40); from this point an incision is carried transversely around the cervix,

FIG. 37.

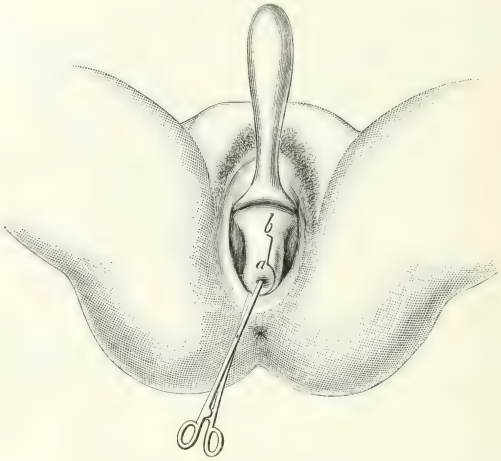


(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

ending posteriorly. This flap is turned up and sutured into the cervix, increasing the size of the canal. The vaginal wall is sutured with catgut.

The recognition that the flexion corresponded to the shorter wall led Nourse to devise an operation to shorten the long wall. He

FIG. 38.

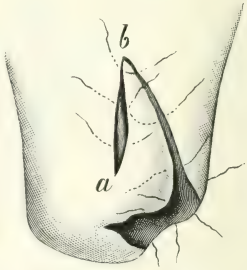


(Vuillet, in *Ann. Univ. Med. Sciences.*)

splits the uterus into halves and slightly above the flexion makes traction upon the long wall, and sutures the incision on either side.

FIG. 39.

FIG. 40.



(Vuillet, in *Ann. Univ. Med. Sciences.*)

The longer lip may be amputated or permitted to contract and heal by granulation. The operation should be immediately preceded by a curettement and disinfection of the uterine canal, otherwise there may be danger of pelvic infection. The operation is quite effective in either anterior or posterior flexion.

Retro-displacements of the uterus are the most frequent form of malposition. They are divided into versions and flexion. The treatment of the two conditions varies but little. It is divided into—

1. *Replacement.*

2. *Maintenance in normal position.* The retention of the uterus in a replaced position is accomplished—

(*a*) By mechanical means.

(*b*) By massage.

(*c*) By operative procedure.

The first division, the replacement of the uterus, may be accomplished—

(1) By combined manipulation.

(2) By instruments.

(3) By position.

As these methods of procedure have been described in an earlier edition, it is unnecessary to discuss them further than to discountenance the use of the intra-uterine sound or repositor. These instruments cannot accomplish the purpose, however carefully handled, without more or less traumatism of an organ whose position necessarily renders it irritable and susceptible to the onset of an inflammatory attack.

Pessary.—We cannot regard the introduction of a pessary as a justifiable procedure unless the uterus has been carefully replaced. The use of a pessary without complete replacement is prone to convert a version into a flexion and to aggravate the trouble. Pessaries should not be worn when there is any fixation of the uterus. Adhesions incline to draw back the fundus and produce discomfort and suffering.

Massage is an agent the value of which has not been appreciated in pelvic diseases. Recent adhesions may be readily overcome and the pelvic distress relieved by its use. Careful selection should be made of cases. The presence of collections of liquid, whether pus, blood, or serum, contraindicate its practice. The method of Schultze, as well as the operative procedures for fixation without opening the peritoneal cavity, is to be condemned. They are blind procedures, capable of much and serious injury without affording an opportunity to recognize and remedy it.

The Alexander-Adams operation has a limited application. It is contra-indicated when there are any perimetritic adhesions, and we have no means of absolutely determining their absence. Many modifications of the operation have been introduced. Newman makes his opening over the internal inguinal opening; he claims for this modification that the ligament is drawn straight out, with greater ease, and that it requires but little dissection. Edebohls lays open the canal

throughout its entire length. The ligament is fastened by silk, silkworm-gut, catgut, or silver wire. The superfluous portion is either cut off, folded up beneath the subcutaneous fascia, fastened by a knot to the opposite ligament, and buried in the incision connecting the two wounds, or the ends are pushed through the fascia and united by sutures.

Ventral fixation, or suspensio uteri, has the advantage over the preceding operation that it is applicable to any displacement; it requires but a single short incision and affords an opportunity to inspect and treat any disease of the pelvic organs. The most valid objection to it is that it has been provocative of trouble in subsequent gestation and parturition. This difficulty is probably overcome by exercising care not to make too broad a band of adhesion or include more than the peritoneum in the sutures fastening the uterus forward. This course, it is claimed, makes a long, slim band of adhesion. Two sutures of fine eye-silk are passed through the peritoneum and fundus, and are buried.

Shortening of the round ligaments is practised from within the abdominal cavity. The middle portion of each broad ligament is sutured with a loop (Wylie), the centre of the middle portion is sutured against the side of the uterus (Dudley), or a suture is passed through the middle portion of one round ligament, though the anterior surface of the fundus uteri and the opposite ligament, when it is tied, swinging the uterus forward (Mann).

Various procedures have been devised to fix the uterus to the abdominal parietes without opening the peritoneum. Baum of Kansas City dilated the uterus and passed to its fundus an instrument by which the organ was carried against the abdomen, and two needles armed with a silkworm-gut suture were thrust through it and the abdomen, between the points the skin was incised and the suture buried. King pushes the fundus against the parietes, makes an incision to the peritoneum and introduces one or two sutures. Both procedures are blind and consequently to be condemned. Still more objectionable is the operation devised by Schucking, which consists in passing by a spring needle a suture through the fundus into the vagina and tying it. The operation brings the uterus into extreme anteflexion. Besides maintaining the uterus in an abnormal position, it endangers the ureter and bladder.

Several operations have been devised by way of the vagina. Mackenrodt made a vertical incision through the anterior vaginal wall, pushed up the bladder, opened the peritoneum, drew forward the uterus and sutured it to the vaginal walls. Where the uterus is held back by adhesions, it is not always easy to separate them through an anterior vaginal incision; the uterus has frequently been so injured

in trying to bring it forward that hysterectomy was resorted to in order to complete the operation. The most serious objection to the procedure, however, is that it has been found to seriously interfere with the progress of subsequent gestation and parturition. Nearly as objectionable is the procedure known as vesico-fixation, in which the attempt is made to obliterate the vesico-uterine fold. Wertheim advocates drawing down, through the anterior colpotomy, each ligament and fastening it in the vaginal wound. The writer has been much pleased with the ease with which he could fasten the round ligaments to the anterior fundal surface through an anterior colpotomy, and is disposed to advise it in preference to the plan proposed by Wertheim.

Gottschalk operates through a posterior vaginal incision. It enables him to break up adhesions and renders the uterus movable. He then introduces a suture through the middle portion of the utero-sacral ligament and the side of the cervix, and a second ligature upon the opposite side. These ligatures tied, the cervix is drawn backward and upward.

In retroflexion with extensive adhesions, a posterior vaginal incision permits the adhesions to be broken up, the uterus brought forward, and the pelvis packed with a large quantity of gauze, which is permitted to remain nearly a week (Pryor).

Prolapsus Uteri.—We do not consider it necessary to discuss the various tentative and radical procedures which have been given in previous editions, but will call attention to Dudley's lateral colporrhaphy. It consists in denuding a surface, beginning at the side of the uterus and extending along the lateral surface of the vagina to the vulva. The sutures are so introduced as to raise up the long posterior vaginal wall. While this operation retracts the vagina and holds it for support to that wall which is least likely to give way, it is yet at fault in that it leaves a heavy uterus free to be subsequently driven through the narrowed canal and the displacement to become re-developed.

Baldy advocates opening the abdomen, doing supravaginal hysterectomy, and securing the stump from displacement by a ligature on either side from the broad-ligament stump.

Noble suspends the cervix from the abdominal parietes.

NEOPLASMS; TUMORS AND CYSTS.

Neoplasms.—New growths are benign and malignant. Those of the vulva have been fully described. The vagina rarely is the site of origin for anything more than small cysts.

The uterus is frequently the source in which a variety of growths known as *fibroids* originate. They may be multiple or single, and vary greatly in the character of their symptoms according to the situation. The submucous and interstitial are prone to the production of hæmorrhage, the subperitoneal may be unsuspected until accidentally discovered. Small subserous growths may exist for years without the production of symptoms. It is better that the patient should not be informed of their existence, as the knowledge unnecessarily adds to her worriment.

The treatment is medical, electrical, and surgical. The medical treatment has been given; it is capable of delaying the progress of growths, decreasing hæmorrhage, and, where the growth is favorably situated, expedites its extrusion from the uterine wall, either as a submucous or subperitoneal tumor.

Electricity.—It was once claimed that this agent was efficient in curing not only symptomatically but radically. Practice, however, has demonstrated that while it is capable of affording relief from pain and hæmorrhage, it has but little if any influence in reducing the size of the tumor.

While it has a beneficial influence in arresting hæmorrhage, and consequently is a valuable adjuvant where the condition of the patient is such as to preclude any operative interference, it is not so expeditious or effective as many comparatively simple surgical measures. No better demonstration of the inefficiency of electricity in reduction of the size of fibroid growths should be required than the result in the Berlin clinics. Of 143 cases in which Apostoli's treatment was carried out, there was but one in which there was a radical cure, and that was in a tumor the size of a fist. In another, a tumor of the submucous variety was expelled from the uterus following intra-uterine galvanism. In 107 cases treated by Nagel and Mackenrodt no appreciable diminution in size was seen. All agree that for the relief of hæmorrhage and pain it was beneficial in 60 to 70 per cent., but relapses were frequent among those relieved, while 30 to 40 per cent. were unrelieved or were made worse. The symptom of hæmorrhage may be much more rapidly and permanently checked by the use of the curette and injections of iodine.

Surgical Resources.

In the surgical procedures we find the most effective and rapid method of dealing with fibroid growths of the uterus. The method will depend, of course, upon the size of the growth, its situation and the amount of the uterus involved. The methods of procedure may be classified, according to the direction in which the mass will be approached, into the vaginal or abdominal. Under the *vaginal* we

have dilatation of the neck, incision of the neck, curettage, myomectomy, ligation of the uterine arteries, and vaginal hysterectomy. By the *abdominal* we have castration, ligation of the ovarian arteries, myomectomy, hysterectomy partial, hysterectomy complete. The vaginal route will be preferable in the submucous or interstitial varieties, where it is possible to enucleate the tumor and leave the uterus. It is also used in those cases of removal of the uterus where the organ is not too large to come through the vagina, or where it can be readily removed piecemeal. Dilatation of the uterus may be done for diagnosis, or exploration of the uterine cavity in cases of doubt in which hæmorrhage is particularly a symptom. Dilatation of the uterus in growths of some size which have become submucous, facilitates the extrusion of the tumor into the vagina or the more rapid separation of the tumor from the uterus. This condition also may be facilitated by an incision of the neck. In a tumor which is of considerable size, of the submucous variety, filling up the cavity of the uterus, the incision of the neck, weakening the resistance of the cervix, will facilitate the delivery of the mass. Incision also affords an opportunity to explore the uterine cavity, and in cases in which it is not deemed advisable to resort at once to operation, in which hæmorrhage is a symptom, it will permit of the incision of the uterine mucous membrane over the surface of the tumor, the consequent contraction of the blood-vessels and arrest of the hæmorrhage. Where hæmorrhage is a marked symptom, one of the most effective methods of its control is by the use of the curette. This should be preceded by dilatation of the neck in order that there should not be defective drainage and accumulation of fluid in the uterine cavity. The curettage brings about a renewal of the uterine mucous membrane, contraction of its blood-vessels, recovery of the health of the patient, and arrest of the symptom hæmorrhage.

Myomectomy.—By this term we mean cutting off a fibroid. This is particularly applicable to fibroid polypi, which usually hang by a distinct pedicle. The removal of the fibroid, if it has a small pedicle, may be readily accomplished by seizing the tumor with a strong volsella and twisting it until the pedicle is torn off, or again, where it is larger and firmer, it may be removed by the use of the scissors. When the pedicle is cut through, it is well to seize the part and apply the Paquelin thermo-cautery to the base, which, while it prevents the danger of infection of this surface, also destroys the stump and decreases the probability of the development from it of another fibroid. Where myomectomy is done, removing a large mass from the uterine cavity, it is better after its delivery that the uterine cavity should be thoroughly irrigated, using for this purpose a normal salt solution, and then packing gently with iodoform gauze. The

object of doing this is to prevent accumulation of fluid in the uterine cavity, which may undergo infection by the presence of pathological germs in the air, or which have been brought to it by the finger or instruments in the manipulation. This packing may remain in the uterus from three or four days to a week; when it is withdrawn the cavity should be thoroughly irrigated and a smaller packing introduced.

Ligation of Uterine Arteries.—In tumors of moderate size, where a large amount of uterine structure is not involved, it may seem undesirable that so radical an operation as extirpation of the uterus should be performed. Indeed, it should be our purpose to save the structures whenever it is possible to do so. Franklin Martin has suggested the ligation of the uterine arteries through the vagina. An incision is made first upon one and then upon the other side of the cervix, partially encircling it; after cutting through the mucous membrane the cellular tissue is reached, the peritoneum is pushed backward, burrowing up into the broad ligament until the uterine artery can be distinctly felt. This is secured by passing a ligature about it, tying it firmly. The opposite ligament is treated in a similar manner. In cases in which hæmorrhage has been very profuse we may burrow further in the broad ligament on one side until the ovarian artery is reached and secured by a ligature, so that subsequently the tumor receives its nutrition only through the remaining ovarian artery. The decreased nutrition necessarily results in arrested growth, if not in diminution of the size of the tumor. From a number of operations which have been performed by Martin and others very satisfactory results have been obtained.

Vaginal Hysterectomy.—Vaginal hysterectomy may be performed in all cases of fibroid growths of small size, whether single or multiple. The method of performance of this operation has already been described under the head of inflammatory diseases of the pelvis. The operation consists, after thorough cleansing of the abdomen, in an incision around the cervix through the vaginal mucous membrane, preferably by means of a thermo-cautery knife, as this decreases the amount of bleeding from the superficial vessels and at the same time affords better drainage, as the burnt surface does not heal up so quickly by granulation. After cutting through the vagina, the tissues are pushed off in front between the uterus and bladder until the peritoneum is reached, in a similar manner, posteriorly. Having reached the peritoneum a pair of clamp forceps are applied on either side, to secure the uterine arteries. The secured portion of the broad ligaments is cut off from the uterus and the cervix amputated near the level of the internal os. This permits the more ready rotation of the uterus, to bring out the fundus. If fibroid masses of considerable size are in the fundus of the uterus and are too large to

permit the entire mass to be brought down, the capsule may be incised, the tumor enucleated, and a number of fibroids removed in this way. After rotation of the fundus and withdrawal of the ovary and tube, a pair of clamp forceps is applied upon the left broad ligament securing that portion not secured by the first clamp, the broad ligament is cut through, the opposite ovary and tube are then turned out and the clamp applied to the broad ligament external to them.

The subsequent treatment of the wound is similar to that which is practised in vaginal hysterectomy for inflammatory troubles. It is important, however, for the control of hæmorrhage that the clamp forceps should remain for a longer period than in the inflammatory cases; indeed, seventy-two hours would seem preferable, for the reason that the vessels are much larger and consequently there is increased tendency to hæmorrhage.

In fibroid tumors of considerable size we may still resort to the vaginal procedure, doing what is known as *morcellement*—the removal of the mass in pieces. For the proper performance of this operation it is necessary to have several double tenacula so that the parts can be held firmly without slipping, and a portion of the mass is seized with a double tenaculum and a piece of tissue cut out. Before the tissue is entirely removed another tenaculum can be inserted, and a tenaculum constantly be kept in the more solid tissue, so that the tumor may not be displaced and thus render it difficult to again secure it. Hæmorrhage is controlled by seizing the blood-vessels in the capsule with a pair of hæmostats, or, as the dissection progresses and the pedicle or broad ligament is drawn down, the control of vessels may be accomplished in a similar manner to the performance of vaginal hysterectomy. With the completion of the removal of the mass the wound is also treated in a similar way. This operation is very popular with the French surgeons.

The *abdominal* procedure also enables us to cut off the blood-supply without the sacrifice of the organ. This operation, introduced by Byron Robinson of Chicago, consists in ligation of each ovarian artery, and after separating the broad ligament making a second ligation in the anastomosis of the ovarian and uterine arteries about midway between the internal os and fundus of the uterus. This cuts off to a large degree the supply of nutrition to the fundus of the organ and permits its subsequent reduction. This operation is fully as effective as the one formerly practised of castration.

Castration is the ligation of each broad-ligament pedicle and the removal of the ovaries. This procedure, however, is not always effective in control of hæmorrhage. In some cases the hæmorrhage is just as great after the removal of the ovaries as before; these are cases, probably, in which the ligation only secures the ovarian branches to

the ovary and tube and does not obstruct the ovarian artery. The passage of the ligature in such a way as also to include the round ligaments renders it more certain that the ovarian artery is included in our ligature.

Myomectomy.—This operation is applicable to all those cases in which the tumor is more or less separated from the body of the organ by a pedicle or neck. In such cases the operation can be readily done with but little hæmorrhage and no severe constitutional effects. If the tumor is attached to the uterus by a broad base its wall may be incised and the tumor itself enucleated. The cavity thus formed, after being carefully trimmed and the shreds of tissue removed, may be closed by turning in its edges and using a continuous catgut suture. The peritoneum over the first row of sutures may be again sutured, making a thicker wall.

Hysterectomy for fibroids is an operation which has been practised for quite a long period. The first operation was probably done by Burnham of Lowell, Mass. The later methods of procedure have rendered the operation of little danger, and consequently it is more frequently practised. The operation may be done by bringing the stump composed of the cervix uteri out through the lower angle of the abdominal wound, in which it is fixed by the insertion of pins. It is then secured beneath the pins by a serre-nœud or the application of an elastic ligature, the peritoneum being stitched to that of the stump beneath the ligature. This procedure results in the separation by a process of sloughing of the external stump, which renders it exceedingly difficult to keep the wound aseptic and prevent suppurative processes in it. After the separation of the external portion of the stump the pedicle retracts, leaving a deep sulcus which must fill up by granulation, and the consequence is that we necessarily have a prolonged convalescence and a weakened ventrum which may result in subsequent ventral hernia. For this reason other methods of treatment of the pedicle or stump were urgently sought.

The operation as devised simultaneously by Eastman, Goffe, and Baer consists in ligation first of that portion of the broad ligaments containing the ovarian arteries, incision between the clamp forceps and the ligature, separation of the peritoneal surfaces, carrying a flap forward in front through the peritoneum, and a second posteriorly. A second ligature is applied on each broad ligament in such a way as to include the uterine artery. Having secured the patient against hæmorrhage in this way, the parts are separated and the tumor removed, making the incision through the stump at or below the external os. Having removed the mass and made sure that hæmorrhage is completely arrested we may proceed to the sterilization of the remaining cervical canal. This may be done by the

introduction of the thermo-cautery, the use of carbolic acid, and if there is much space in the tissue above from which oozing is likely to occur, it may be packed with iodoform gauze, taking the precaution to pass its end through the cervix so that it may be removed by the vagina. The peritoneum should be stitched over the gauze so that the stump is entirely shut out from the peritoneal cavity, and we have consequently an extra-peritoneal treatment of the stump.

Where the cervix is large or taken up to a great degree by the tumor, complete hysterectomy will be preferable. In the performance of this operation ligatures are applied in a similar manner, the second ligatures at a sufficient depth to make sure that the uterine arteries are secured, then, making an incision through the posterior cul-de-sac into the vagina, the finger is introduced and the stump left by the previous removal of the fundus uteri is cut around and completely removed. After cleansing the vaginal surface it is united by sutures and the peritoneal surface closed, making the operation a clean one so far as the peritoneal cavity is concerned. This operation is fully as efficient, and the mortality no greater, than in partial hysterectomy.

In the removal of fibroid tumors there are special difficulties which demand particular consideration according to the situation of the growth. Not infrequently we shall find the growth situated in a broad ligament, compressing or displacing a ureter, so that the removal by the way we have just mentioned will be exceedingly difficult and greatly endanger the continuity of the ureter.

We may ligate both ovarian arteries in mass if practicable, then ligate the deeper portion of the broad ligament upon the free side, and tilt the uterus (Pryor), cut from one side to the other across the cervix (Kelly); the bladder having been previously separated we ligate the lower portion of the ligament, which includes the uterine artery, and roll out the tumor, having it connected only by the spread-out folds of the broad ligament, which can now be easily separated without danger of injury to any of the viscera. If the ovarian artery has not been previously secured it can now be ligated.

Tumors of the Tubes and Ovaries.

Fibroma of the tubes is rare; of the ovary, more frequent, but in less proportion than cystoma. The treatment is removal, but it does not differ from the operation of ovariotomy. The treatment of such tumors of the tube as pyosalpinx, hydrosalpinx, and hæmatosalpinx has already been described under the head of inflammatory diseases.

Tumors of the ovary are divided into large and small. The large tumors comprise the glandular and papillary, proliferating, and the dermoid. The small cysts are (1) the small residual cyst of Morgagni; (2) the follicular cyst; (3) cysts of corpus luteum; (4)

tubo-ovarian cysts. The small cysts only demand treatment when they give rise to symptoms, which is much less frequently than is suspected. The treatment may consist in ovariotomy, or the resection of the ovary, saving as much of the healthy structure as possible.

The only treatment of large cysts is *ovariotomy*. In very large cysts, where the danger of shock is great, a few days' preliminary tapping may be done. The details of ovariotomy are given in Volume III. Occasionally an ovarian tumor will be found presenting adhesions of such a character as to preclude its removal. Such cases in the hands of experienced and skilled operators are exceedingly rare. When it is decided to retain the cyst, it should be opened, and its cavity gone over with the hand. Partitions should be broken down, the cavity irrigated with a normal salt solution, and subsequently packed with iodoform gauze. The opening in the cyst should be stitched to the abdominal parietes to prevent infection of the peritoneal cavity.

Dermoid cysts should not be tapped and particular care should be exercised that the cyst does not rupture during removal, as its contents are exceedingly infectious.

Broad-ligament Cysts.—These growths should be removed. It is true that they sometimes disappear after an accidental rupture or a tapping, but the result is not sufficiently certain, nor can we always be so confident of our diagnosis as to render the treatment by tapping justifiable. The writer has recently seen a small cyst of this variety whose pedicle had become twisted and cut off the circulation, resulting in death of the tumor. The patient had had repeated attacks of right inguinal pain, simulating appendicitis and so diagnosticated.

In the removal of broad-ligament and intra-ligamentary ovarian cysts great care must be exercised not to injure the intestine, the bladder, and particularly the ureter. The latter will often be found closely adherent to the cyst-wall. Not infrequently it will pass directly over it and will be cut or torn unless the enveloping tissue is carefully examined.

Rupture of the ureter demands immediate attention, and various methods have been practised: extirpation of the kidney, ligation of the ureter, establishment of a urinary fistula, anastomosis with the colon (Van Hook), uretero-ureteral anastomosis (Kelly, Bache Emmett), or uretero-cystotomy (Novaro, Kelly, Krug, Penrose, Baldy). Removal of the kidney—in the duration of operation and the necessity for increased dissection—adds much to the danger for the patient.

Ligation must be supplemented by the use of a second ligature or there will be leakage, as the tissues soften under the ligature. As soon as the pressure from the accumulation equals the blood-pressure, secretion ceases and the kidney ultimately atrophies. The success of

this procedure, as well as that of extirpation of the kidney, is largely dependent upon the condition of the other kidney, as it must do all the work. Intestinal anastomosis is unsatisfactory. The introduction of urine into the intestinal canal from its irritation increases peristalsis and thus occasions annoyance. The danger of infection of the kidneys is not insignificant.

Anastomosis between the two ends of the ureter presupposes that they can be readily brought together, and that the peripheral end is patulous and can be made to receive the upper end without obstruction. The end of the peripheral portion should be closed and the communication be made through a slit in its side.

Undoubtedly, where it can be accomplished the direct implantation of the end of the ureter into the bladder is the most desirable procedure. The point of entrance should be made at the upper part by a small incision, the muscular walls should be united by fine catgut and a second row of sutures to the external surfaces. No traction should be made upon the ureter by the bladder. If it has been necessary to somewhat displace the bladder, it should be anchored to the surrounding tissue to prevent dragging upon the ureter. Drainage should be used to afford vent for any possible leakage. Intestinal and bladder lesions should be carefully sutured before the wound is closed.

Malignant Neoplasms.—Under this title may be classed the various forms of cancer and sarcoma. They may affect any part of the genital tract, but primarily, most generally, the uterus or vulva, rarely the vagina. While malignant disease is most frequently found to occur near the climacteric, it may affect the woman at any age, whether married or single. When the disease occurs early in life, either from inability of the system to resist its ravages or from special susceptibility to its influence, the progress is rapid. Medicine, either local or general, has afforded us but little assistance. So-called specifics have been advocated, but their efficacy is only apparent to those who have introduced them. Recently, various remedies have been given hypodermically with the purpose of arresting the progress of the disease. These remedies are injected into the diseased structures. As the majority of the cases have passed beyond the stage when hope for cure by any operative procedure can be entertained, it seems but proper that such investigations should be continued. Despres makes deep injections of refined petroleum, which, while painful, cause speedy separation of sloughs, desiccation of ulcerated surfaces, and disappearance of odor.

Schultze of Buda-Pesth and Vuillet of Geneva advocate the use of absolute alcohol; the latter injects it by a number of syringes deeply into the indurated tissue, permitting the instrument to remain some

time to prevent the fluid running back through the needle-track. It causes hardening of the tissue and gradual separation of the diseased tissues.

Lewis and Boldt have given pyoktanin hypodermically with beneficial results. It should not be given in doses larger than gr. iiss at any one sitting.

Bernhardt advocates the use of a 6 per cent. solution of salicylic acid in alcohol at 60°. Seven or eight injections of a few drops should be given at each sitting, the whole quantity not to exceed ℳxxxj.

Where the disease is too extensive for radical cure we have to consider palliative measures. The progress of the disease may be arrested or delayed by the use of the sharp curette, followed by the application of a caustic. The most effective caustic is undoubtedly the zinc chloride. Great care must be exercised in the use of this agent to confine its destructive qualities to the diseased tissue. Without special precautions the vagina and vulva are prone to become burned, sometimes to the destruction of the vaginal walls. The actual cautery is another valuable agent. Its application is somewhat difficult, as the thermocautery becomes so cooled by the blood that it requires frequent reheating.

These measures arrest hæmorrhage and cause sloughing of the broken-down tissue and cicatrization of the diseased surfaces. The arrest of the severe drain soon produces a greatly improved condition and appearance, but unfortunately it is only temporary. In bad cases the disagreeable odor, the pain, and the hæmorrhage are the symptoms which will demand especial consideration. The vagina should be irrigated with large quantities of hot water, salt solution, peroxide of hydrogen and water, a solution of listerine, or the chlorinated waters, of which one of the best is a preparation known as electrozone.

Lucas advises the following powder as a dressing: Benzoin, iodoform, magnesii carbonat., āā. ʒij—which will arrest and diminish the fetid discharge and prevent excoriation of the vulva and vagina. Hæmorrhage is controlled by injections of hot saturated solution of alum, the use of perchloride of iron, followed, if necessary, by gauze packing.

Pain frequently is so severe as to require the use of large quantities of anodynes. While in hopeless cases we should have no hesitation as to the formation of the opium-habit, yet it is better for the patient that its use should be delayed so long as relief can be maintained by other drugs. The agents which may be serviceable are belladonna, hyoscyamus, chloral, antipyrin, and acetanilide. When opium is given, it should be husbanded so that its effect may not be exhausted

before the disease has run its course. It may be given by the mouth, in the form of a suppository by the rectum, or hypodermically. The use of the hypodermic syringe should not be placed in the hands of the patient or a member of the family, as the quantity of the drug will be augmented too rapidly.

Operation.—None of the measures we have given should be for one moment considered where the case is operable. When the disease is confined to the uterus, whether it originated in the cervix or body of the organ operation, should be advised. We may choose between high amputation and extirpation. It seems just as desirable to get well beyond the confines of the disease when it originates in the uterus as in involvement of the mammary gland, consequently hysterectomy should be preferred. This operation may be done either through a vaginal or abdominal incision. If the disease is confined to the canal of the cervix or to the body of the uterus, the vaginal operation is the preferable procedure, as by it the uterus can be removed in less time and with less dissection. The operation may be done with the use of ligatures to prevent hæmorrhage, or we may resort to clamps. The latter method of hæmostatasis is preferable, for the reason that it can be performed more expeditiously and no ligatures remain to become infected and keep up subsequent discharge. In extensive involvement of the uterus, extending upon the vagina and with a suspicion of extension into the broad ligaments, the abdominal incision affords the best opportunity for thorough removal. It permits an inspection of the condition of the pelvic contents and removal of a large amount of tissue. Clark and Kelly have advocated the previous introduction of catheters into the ureters, but the danger of breaking a catheter, the difficulty in the subsequent removal of the fragments, and the fact that such landmark is unnecessary render it inadvisable.

The principal dangers in the operation are hæmorrhage and injury to the ureters. When it is apparent that they are liable to injury or ligation it is better that the peritoneum should be opened, and the ureter raised and held to one side while the dissection and ligation are accomplished.

Generally hæmorrhage can be prevented by ligation of ovarian and uterine arteries, but in extensive involvement of the pelvic floor, where the disease extends upon the vagina, the ligation of the anterior trunk of the internal iliac arteries (Kelly, Polk) may be practised. Ordinarily this arrests the circulation in the superior, middle, and inferior vesical, the middle hæmorrhoidal, the uterine, the vaginal, the internal pudic, the obturator, and the sciatic, but the distribution of the vessels between the anterior and posterior trunks is uncertain and the anterior trunk is frequently very short (Pryor), so that the writer in a recent case

ligated both internal iliac arteries. The ovarian arteries had previously been ligated. The tissues were then cut away without the necessity of any further ligation. The ligation of the entire vessel only arrests the circulation, in addition, through the lateral sacral, the ileo-lumbar, and the gluteal arteries. The tissues supplied by these vessels are capable of being cared for by the collateral circulation. In addition to the better control of hæmorrhage, the more expeditious operation, the greater security for the ureters in that they are under observation, this procedure affords a hope that any portion of malignant disease unremoved may disintegrate and be thrown off, owing to its circulation being temporarily arrested. The diseased tissue being less highly organized is more easily starved.

The surgical treatment of pelvic cancer should not be dismissed without reference to the readiness with which malignant disease of the uterus can be reached by the operation of sacral resection. The extent of dissection and injury to bone-structures will forbid its practice unless the affection of the uterus is complicated with involvement of the rectum. This section permits the diseased organs to be attacked directly from behind, where the ureters are readily observed and avoided, the vessels easily ligated, and the organ most readily accessible.

THERAPEUTICS OF THE MALE GENITO-URINARY TRACT.

By WILLIAM T. BELFIELD, M. D.

INFECTIONS OF THE GENITO-URINARY TRACT IN THE MALE.

The genito-urinary tract of the male may exhibit a primary infection by the following parasites:

1. The *gonococcus* of Neisser;
2. The as-yet-undiscovered *agent that induces syphilis;*
3. The *bacillus tuberculosis* of Koch;
4. The various bacterial species that cause suppuration—a dozen or more in number, collectively termed the *pyogenic bacteria* or *pus-microbes.*

To the gonococcus- and syphilis-infections all are apparently susceptible; freedom from either disease is secured only by avoiding the infecting agent. To the tubercle- and pus-infections, on the other hand, all are frequently exposed; hence freedom from these infections is secured not by avoiding the infecting agents (which is impossible), but by the natural resistance of healthy tissues. In other words—and this is the item of clinical importance—either tuberculosis or suppuration in the genito-urinary organs implies a pre-existing vice of nutrition. Cystitis, prostatitis, and pyelitis (non-gonorrhœal) are results—are secondary, not primary diseases.

GONOCOCCUS-INFECTION (GONORRHŒA).

The gonococcus of Neisser, usually reinforced by pus-bacteria as a mixed infection, is the agent in the induction of the severe urethritis known as typical gonorrhœa.

Beginning at the meatus, the extent of the surface invasion varies: in a minority of cases the infection invades only the penile urethra, ceasing at the triangular ligament; in the majority it extends, during the second or third week, through the membranous and prostatic urethra to the vesical orifice; in many it passes on through the ejacu-

latory duct to the seminal vesicle and the dilated extremity of the vas deferens (ampulla); and in 5 to 10 per cent. of cases the infection finally, in the third or fourth week, traverses the vas deferens to the epididymis.

Infection of the lymph-stream is usually arrested in the inguinal and pelvic lymph-glands, though frequently resulting in periurethral suppuration and sometimes in peritonitis. Infection of the blood-current takes place fortunately in only 2 or 3 per cent. of cases, usually as the so-called gonorrhœal rheumatism of fibrous and serous structures—joints, tendon-sheaths, bursæ, muscles; sometimes it attacks the endo- and pericardium or meninges—with fatal result.

The urinary channel proper, above its junction with the seminal canal, usually escapes, the infection ceasing at or about the vesico-urethral orifice; occasionally, however, it extends to trigone, ureter, renal pelvis, and even kidney-tubules.

The virulence of the gonococcus, as of other pathogenic bacteria, undoubtedly varies extremely, though evidence to this effect must for obvious reasons be clinical rather than experimental; such evidence consists of observations like the following: A girl of nineteen, married two weeks, to whose virginity at marriage the husband gave convincing testimony, was found to be the subject of a mild gonorrhœa. The husband had had the disease less than a year before his marriage, the discharge ceasing in about six weeks; it reappeared two days after his wedding. Numerous gonococci were found in the pus from the wife, a few in that from the husband. The girl was apparently well a month after marriage, having suffered no discomfort except from an inflamed inguinal gland; the discharge had been but slight.

The persistence of the gonococcus-infection likewise varies extremely. The writer cannot subscribe to the rather prevalent view which, promulgated a quarter of a century ago by Noeggerath, considers such infection practically permanent, either evident or "latent." It cannot be denied that the infection has been known to persist for years: G. E. Brewer reports an instance in which a man infected his bride six years after his own last attack, and Goll has found gonococci in cases two and three years after the infection. But, on the other hand, the complete disappearance of all evidences of infection, including gonococci, within three to six months has been often observed: the writer has assented to the marriage of a patient eight months after the disease began; and Goll failed to find gonococci in 80 per cent. of all cases examined even three months after the infection began. While, therefore, great caution should be exercised, repeated examinations of urinary threads made, and several months permitted to elapse after the apparent disappearance of the gonococcus before the resumption of sexual relations can be authorized by the

physician, yet each individual case must be decided on its own merits. The frequency with which married men who have contracted the infection resume conjugal relations even before the complete disappearance of the discharge, without apparent injury to their wives, supports the belief that gonorrhœa—in the clinical sense at least—does not usually retain great virulence for many weeks after apparent recovery.

The belief that the gonococcus-infection is a serious barrier to a man's future fertility is also contradicted by clinical observation. It is fair to assume that a large percentage of the fathers of the present day who spent their early manhood in cities have at some time contracted the infection. The writer has known a woman to become pregnant within four months of the beginning of the infection in her husband and herself.

What constitutes gonorrhœa? The confusion which reigned prior to Neisser's discovery of the gonococcus in 1879, as to the nature of purulent discharges from male and female genitals, was replaced a few years thereafter by the practice of regarding gonococcus-infection and purulent urethritis as synonymous terms. But further observations have proven beyond doubt that gonorrhœa in the clinical sense —that is, purulent urethritis acquired through sexual contact—is more comprehensive than gonococcus-infection; in other words, that the genitals of either sex are the habitat of certain bacteria other than the gonococcus (perhaps also of toxins) which may, when transferred through the sexual relation, occasion a purulent inflammation. And it is further established that purulent urethritis in the male—like purulent salpingitis, metritis, and vulvitis in the female—may occur when no specific bacteria are present and when no sexual contact whatever, according to the best evidence obtainable, has taken place. While it is doubtless true that in 90 per cent. of cases of purulent urethritis in the male the gonococcus-infection, acquired in the usual way, is the cause, yet it may be of vital importance in a particular case to remember the other 10 per cent. of cases which arise without gonococcus-infection, and some of which at least occur without sexual contact. It appears desirable that by general agreement the ancient term "gonorrhœa" should be now defined as "gonococcus-infection" rather than made to include all cases of purulent urethritis which are or are assumed to be acquired by sexual contact; and in this specific sense the word will be used in this article.

Non-gonorrhœal Urethritis.—Many accurately observed cases are now recorded in which the pus from a purulent urethritis following upon and apparently due to sexual contact has contained absolutely no gonococci. In some of these, various kinds of bacteria have been found—a diplococcus, a streptococcus, the colon bacillus; in certain

other instances no bacterial species was found in numbers sufficient to warrant a presumption of causal relation; and in at least one carefully observed case no bacteria whatever were discovered. In this instance a man, a few days after returning to his wife from a long absence, developed a profuse purulent urethritis, which was called gonorrhœa by his physician; the patient brought an action for divorce, alleging that his disease proved his wife's infidelity. Neisser himself examined the pus, and testified that it contained neither gonococci nor other bacteria.

Again, it has been shown that a diplococcus, indistinguishable by any laboratory test from the gonococcus, is occasionally found in small numbers in slight purulent discharges where sexual infection is at least very improbable. Whether this organism is a distinct species, a "pseudo-gonococcus," or whether it is the gonococcus exhibiting a wide range of virulence, are questions yet to be answered.

Finally, many cases of profuse purulent urethritis arise without infection of any sort from without. These are of two categories: first, cases of "auto-infection;" and second, cases in which the urethra becomes inflamed as the result of a local or general vice of nutrition.

Auto-infection of the anterior from the deep urethra, an exacerbation of an apparently cured but really uncured gonorrhœa, is exceedingly frequent; and because, following sexual indulgence, it is often considered a real gonorrhœa by patient and physican alike, auto-infection has given rise to many erroneous ideas as to both prognosis and treatment of gonorrhœa. The man who thinks he has had the disease a hundred times and can cure it in a few days, the physician who has a sure cure for gonorrhœa, are alike deceived; for they have failed to distinguish between a fresh gonorrhœal infection from without and an exacerbation of a chronic uncured gonorrhœa. This failure to differentiate between the two arises largely from the general neglect to distinguish *chronic gonorrhœa* from *gleet;* for these terms are usually considered synonymous, and the patient in whom the discharge from the meatus has ceased is considered cured. But the fact is that long after such free discharge has disappeared (showing the subsidence of the inflammation in the anterior urethra), the infection—that is, the gonococcus—may persist in some of the numerous follicles and glands of the posterior genital canal, especially the prostate and seminal vesicles. Sometimes this persistence is indicated by a gumming of the meatus in the morning; sometimes by the presence of pus-threads in the urine; in other cases only a diffuse purulent cloudiness of the urine betrays the infection; and in still other instances its persistence is not revealed until pressure upon the prostate and vesicles by the examiner's finger in the rectum forces pus into the urethra. Such cases of persistent gonorrhœal infection of prostate and vesicles, even without perceptible discharge from the meatus, may within

twenty-four hours after sexual indulgence be aggravated into a profuse purulent discharge—that is, an auto-infection of the anterior urethra. This is commonly considered a fresh gonorrhœa; and because it subsides within a few days (as it may under indifferent treatment) the particular injection or nostrum used during those days is credited with the cure of a gonorrhœa.

A patient of the writer's contracted gonorrhœa about four years ago and was apparently cured in two months; yet his first sexual indulgence thereafter was followed by (apparently) another attack. This discharge disappeared in a few days; yet almost every sexual act during four years thereafter was followed by a profuse purulent discharge, lasting from five to thirty days and considered by the patient a gonorrhœa. During this time he used numerous injections, submitted to division of an alleged stricture of large calibre, to a perineal section, and to electrical treatment of the deep urethra, and took quantities of various medicines. During his periods of continence, sometimes for months, there was neither gleet nor other sign of infection except a slight cloudiness of the urine (pus); but the renewal of sexual relations almost invariably entailed a purulent discharge, even when the use of a condom prevented fresh infection.

Pressure with the finger on the seminal vesicles and prostate caused the discharge from the meatus of thick, purulent fluid containing pus-microbes; and only after the vesicles and prostatic follicles had been repeatedly emptied by digital pressure from the rectum ("milking"), did the patient become able to indulge sexually without apparently contracting a gonorrhœa; in other words, the pus-infection which had so long been harbored in the deeper parts of the genital canal, and had so frequently infected the anterior urethra, was finally dislodged by mechanical means. When, therefore, a patient presents a profuse purulent urethritis following suspicious connection, it should be remembered that the infection of the urethra may have come not from the front but from the rear, particularly if the patient give a history of a previous infection.

Auto-infection of the anterior urethra independent of the gonococcus is observed especially in elderly men and in those of gouty tendencies; it is preceded by a chronic prostatitis and vesiculitis. A patient of the writer's, seventy-six years old, whose sexual activity had ceased years before, exhibited the clinical picture of gonorrhœa of several weeks' duration, which, however, promptly disappeared after "milking" of the engorged prostate and vesicles.

And finally, purulent urethritis is occasionally due to vices of nutrition, drugs, or local injury; thus a young man who suffered for the first time from a mild urethritis denied all exposure for several months previously; neither gonococci nor other cause for the disease

could be found until it was learned that the patient habitually drank a large quantity of ginger-ale daily; upon the discontinuance of this beverage (containing capsicum) the urethritis promptly ceased. In another case an undeveloped, sickly boy of twelve years had a severe urethritis which ceased without local treatment upon the removal of a stone from the bladder.

The differential diagnosis of urethral discharges requires, therefore, careful consideration of both clinical and microscopical evidence. They may be grouped in four classes:

1. *Gonococcus-infection from without*, marked clinically by an incubation of three to seven days (usually) and a severe inflammatory reaction; the microscope shows an abundance of gonococci contained in both pus and epithelial cells.

2. *Gonococcus-infection from within (auto-infection of the anterior from the deep urethra)*, marked clinically by an incubation of six to twenty-four hours in a patient with a history of previous urethritis followed by a slight gleet, gumming of the meatus or pus-threads in the urine; the microscope may show gonococci, though in less numbers than in cases of the former class.

These two categories include over 90 per cent. of all cases of purulent urethritis in the male.

3. *Non-gonorrhœal infection from without*, beginning within two days after exposure, with slight inflammatory reaction; the microscope shows no gonococci but many pus-bacteria.

4. *Non-gonorrhœal infection from within;* this may be an extension to the anterior urethra of an inflammation in prostate and seminal vesicles in elderly men; it may follow injury by urethral instruments or caustic injections; or it may be due to undefined errors of nutrition. No gonococci are visible.

Treatment.

Efforts to mitigate the gonorrhœal inflammation have heretofore consisted of local applications (injections), and of the internal administration of substances like the balsams, which, being eliminated by the kidneys, irrigate the inflamed surfaces during urination. All such measures are at best but palliative; the anatomical reasons are alone sufficient to explain the futility of all surface medication. For the urethra is dotted with numerous lacunæ, half of them opening backward, into which no injection nor urinated fluid can be expected to enter; while Cowper's glands, the prostatic follicles, the utricle, and seminal vesicles, into all of which the infection may and often does extend, are evidently beyond the reach of urethral medication; moreover, the gonococci may penetrate the subepithelial tissue.

The rational treatment of gonorrhœa—the destruction of the in-

vading bacteria, or at least the inhibition of their growth—must evidently be accomplished by way of the blood-current; for this is the one medium by which the entire infected surface, its nooks and crannies, lacunæ and follicles included, can be reached. To this end the writer has for two years past administered internally certain agents which, whatever their mode of action, are known to materially enhance the resistance of the tissues to invasion by pyogenic bacteria: guaiacol, pilocarpine, nuclein, protonuclein, and thyroid substance. Each of these agents usually exhibits a decided effect in diminishing the purulent discharge of acute gonorrhœa, sometimes indeed changing it from pus to a glycerin-like fluid within forty-eight hours. Bacteriological examination of this fluid shows but few pus-microbes yet many gonococci; evidently these remedies, though very efficient against the pyogenic bacteria of the mixed infection, fail to materially inhibit the growth of the specific coccus. Nevertheless the abolition of the usual purulent discharge and the repression of the complications due to the pus-bacteria constitute a most gratifying advance in the treatment of this hitherto intractable disease.

Of the substances named the animal derivatives have seemed the most efficient: the thyroid-substance in 2-grain doses four times a day, or protonuclein in 3-grain doses six to eight times a day, usually secures a prompt result; the unpleasant effect sometimes produced by the thyroids upon the heart has led the writer to the more general use of protonuclein.

The treatment of anterior urethritis may be thus summarized: The patient should be instructed to scrupulously avoid constipation, bodily activity, alcohol, and sexual excitement, and to limit his indulgence in meats, coffee, and tobacco; he should destroy or sterilize by boiling any cloths or handkerchiefs soiled by the discharge and, to protect his own eyes, should wash his hands immediately after every contact with the infected parts or dressings; he should protect his linen, not by inserting cotton under the foreskin (because the pus is thereby retained in the urethra and spread over the glans), but by wearing a gonorrhœa-bag or similar article which, without compression of the penis, permits the escape of pus into the receptacle.

Medicinal treatment is internal and local; the former consists of laxatives, diuretics, and protonuclein as above mentioned; the local treatment consists of the free use of hot water for immersion and for injection, and of a saturated solution of hydrastine muriate to be injected four to six times per day. Injections of a 5 to 10 per cent. watery solution of argonin (a compound of silver with casein) are highly recommended by several careful observers; after considerable experience with this remedy the writer still prefers the hydrastine muriate. Injections should be made with a hard-rubber syringe

holding half an ounce and terminating in a blunt tip without nozzle; and it is wise for the physician to instruct the patient how to inject, both verbally and by administering an injection and by causing the patient to repeat the process in the doctor's presence.

Under such treatment the discharge becomes slight and watery within thirty-six hours; nevertheless the disease is not eradicated, and the treatment—at least the internal medication—must be continued for a month or more. It should be impressed upon the patient that the cessation of free discharge from the meatus does not prove that he has recovered; for long after this stoppage of the flow there may persist various evidences of disease, such as a gumming together of the meatus especially during the night, the appearance of a milky drop in the morning, and the constant presence in the urine of thick white threads of pus (*Tripper-fäden*), which soon sink to the bottom of the vessel. The persistence of any of these phenomena indicates the presence of one or more infected areas in the genital canal, and the case must be considered one of chronic gonorrhœa.

CHRONIC GONORRHŒA; GLEET.

It has been customary to consider chronic gonorrhœa and gleet synonymous terms—an erroneous conception, for by a gleet we understand a discharge from the meatus, while the gonorrhœal infection often persists in the prostatic urethra and seminal vesicles long after the anterior urethra is practically well and free discharge has ceased. Hence a chronic gonorrhœa may long exist without a gleet—an important clinical distinction. Gleet is the continuation of a discharge from the meatus and may vary from a profuse milky to a slight watery flow; during the day there may be no distinct discharge but only a gumming of the meatus; in the morning a drop or two of milky fluid can be expressed. While the discharge proceeds directly from the anterior urethra, its source may lie in the prostate or seminal vesicles; failure to recognize this fact is the explanation of many failures to stop the discharge: the patient uses one drug after another, one injection after another, with only temporary relief.

The first step toward the intelligent treatment of gleet is therefore the discovery of the infected area, which may be found anywhere from the meatus to the vas deferens. For practical diagnosis and treatment the possible sources of a gleety discharge may be divided into three groups: 1. Anterior urethra (to the bulbo-membranous junction); 2. Deep urethra (from bulb to bladder, including the membranous and prostatic urethra and utricle); and 3. Prostate, seminal vesicles, and ampullæ.

The simplest means for determining which of these three portions is the source of the gleet is called the "three-glass test," which is thus made: The patient, having retained his urine for two hours or more, submits to a thorough irrigation of the anterior urethra; he then passes about an ounce of urine into the first glass, whereby the pus is washed from the deep urethra; the physician's finger (enclosed in a rubber condom) is then introduced into the rectum and gently presses the prostate and seminal vesicles; the patient then passes another ounce of urine into the second vessel and the remainder into the third. A comparison of the amount of pus in the respective glasses affords a fair inference as to its source. It is chiefly important to know whether the pus-production is limited to the anterior urethra or extends also to the deep urethra; in the latter case some involvement of the prostate and seminal vesicles may be expected.

Digital examination *per rectum* should never be neglected in determining the source of a gleety discharge, even though the anterior urethra is found to be strictured or otherwise diseased; for the prostate and seminal vesicles are often the seat of persistent infection and contribute to or even originate the discharge.

Treatment of Chronic Gonorrhœa and Gleet.

The first step is a determination of the seat of the diseased area, as already outlined; a routine prescription of injections or use of sounds, while curing a certain number, will fail to relieve many that are amenable to intelligent treatment.

Certain general measures are applicable to all cases. They should carefully avoid constipation, alcohol, and the excessive use of tobacco and coffee. The special measures that may be required are—1. Sounds; 2. Injections, anterior and deep; 3. "Milking" of the prostate and seminal vesicles; 4. Medicines; and (occasionally) 5. Local applications to diseased patches through the endoscope.

1. Sounds.—A stricture should be treated by gradual dilatation carried to the full calibre of the urethra (No. 32 to 36 French). If a narrow meatus prevents the use of large sounds, the surgeon should choose between enlargement of the meatus (which is advisable in exceptional cases only, when the calibre is less than No. 20 French) and dilatation by means of special instruments, the dilators of Otis, Tuttle, and Oberländer.

2. Injections.—Of the multitude of injections recommended for gleet of the anterior urethra the following are useful: hot water (as hot as can be borne), alone, and containing in solution hydrastine muriate (saturated) or picric acid, zinc permanganate, nitrate of silver, 1 grain to 8 ounces.

Deep Injections.—Liquids injected from the meatus do not ordinarily reach the deep urethra because arrested by the so-called "cut-off" muscle, that is the membranous urethra; medication for the deep urethra is therefore usually made through a tube introduced beyond the bulb. Special syringes for this purpose have been designed by Guyon, Keyes, and others, whereby an exact number of minims of a given strong solution can be deposited in the deep urethra, a process often called "instillation." A better practice is irrigation of the deep urethra with a larger quantity of a weaker solution; for this purpose a small soft catheter (sterilized) is introduced until the urine flows, then withdrawn about an inch and a half; a five-ounce rubber syringe or small fountain syringe (hung low) is then attached. The solution passes from the catheter into the deep urethra and thence into the bladder, the cut-off muscle preventing its escape anteriorly; the catheter is then withdrawn and the patient empties the bladder, thus passing the solution a second time over the deep urethra. The solutions used may be nitrate of silver (1 part to 5000 of water) or bichloride of mercury (1 part to 10,000). Many patients can with practice inject the bladder without a catheter; liquids gently injected by means of an Ultzmann five-ounce syringe may, after slight delay at the cut-off muscle, flow into the bladder: elderly men are especially favorable subjects for this method.

3. Milking the prostate and seminal vesicles is always required when these parts are obviously diseased, and is sometimes useful even when no morbid condition is detected. This manipulation is thus performed: The physician's forefinger, enclosed in a rubber condom which should be anointed with glycerin, is gently introduced into the rectum, the patient either lying on the back or standing with body bent forward; the seminal vesicle being identified on one side of the rectum, the tip of the finger is drawn gently along it toward the prostate; this manœuvre is repeated six or eight times, after which the other vesicle can be, if necessary, similarly treated. The finger then being partly withdrawn, its tip is made to stroke the prostate toward the anus in a similar gentle manner; the prostatic utricle, which lies between the lateral lobes of the organ and is often distended with pus, should be included in this stroking process. During this manipulation and immediately afterward a purulent fluid may be discharged from the meatus. This milking process should always be performed with great care and gentleness; for the prostate, particularly when the subject of chronic inflammation, is exceedingly sensitive, and the operation at first very painful, often inducing faintness on the part of the patient (for this latter reason the recumbent is preferable to the standing posture for the patient). The process should not be repeated oftener than once in six or seven days; greater frequency or

undue pressure with the finger sometimes provokes an extension of the inflammation to the epididymis.

4. Medicines administered by the mouth cannot be relied upon to influence a gleet: some effect may be obtained from thyroid powder in 2- or 3-grain doses three times a day, or turpentine oil or tincture of cantharides in 3-drop doses. Iron and other tonics are beneficial to a patient showing signs of anæmia; mercury and iodine when syphilis is admitted or probable; guaiacol in tuberculous subjects; in malarial districts quinine may have a decided effect in checking gleet.

5. Local applications to diseased areas through the urethroscope are sometimes necessary: the diseased surface is brought into the field, cleansed with cotton, and touched with a stick of copper sulphate, or a solution of silver nitrate or of chromic acid (5 to 20 per cent.), the application being repeated every few days as the course of events indicates.

SYPHILIS.

The chancre occurs within the urethra more frequently than is generally stated; doubtless the slight purulent discharge which it occasions is usually mistaken for a mild gonorrhœa. The reprehensible but extensive practice of widely incising the meatus—so prevalent in the past few years in the search for strictures of large calibre—has doubtless favored urethral infection with syphilis as well as with gonorrhœa. The writer has seen urethral chancre followed by the usual constitutional symptoms in two brothers in each of whom the meatus had been widely divided.

Constitutional syphilis is seen in the urethra, penis, kidney, scrotum, and testicle. In the urethra it may cause a slight purulent discharge which is said to proceed from mucous patches similar to those commonly observed in the mouth; this has perhaps sometimes been treated locally and unsuccessfully as a gleet; it yields readily to internal treatment for syphilis. Every subject of an obstinate gleet should be interrogated as to previous syphilis.

In the penis gummata occur in the cavernous bodies, in the furrow between them, and in the glans; distinct nodules in these localities should always arouse a suspicion of syphilis and lead to specific treatment; an ulcerating gumma of the glans must not be mistaken for epithelioma.

There have been reported a few cases of gumma of the kidney simulating tuberculosis of that organ; in two such nephrectomy was

made, and the diagnosis corrected by examination of the specimen. The differential diagnosis must rest upon the absence of tubercle bacilli from the urine and upon the effects of syphilitic treatment.

In the scrotum syphilis often appears as broad condylomata, usually associated with similar growths at the anal margin or behind the corona glandis; their appearance is characteristic.

The testicle is frequently the seat of gummata which are liable to be mistaken for other neoplasms. The syphilitic testicle is smooth, globular, and painless—characteristics by which it is distinguished from most other enlargements. In general, every doubtful tumor of the testicle should be subjected to the internal administration of mercury and iodine as well as to mercurial inunction locally.

TUBERCULOSIS.

The tubercle bacillus causes a frequent and clinically important primary infection of the genito-urinary organs, aside from the numerous cases of secondary infection of those organs from primary disease of the lungs.

By primary tuberculosis is meant the earliest perceptible tuberculous focus; it is probable that infection of the bronchial glands or other inaccessible parts usually precedes the appearance of the disease in the genito-urinary tract. Primary tuberculosis of these organs is usually first seen in the epididymis and the ejaculatory duct, less commonly in the kidney; but it rarely remains long limited to these organs, the prostate and seminal vesicle usually exhibiting the infection when the patient is first seen. While it must be admitted that the fœtus at birth may contain tubercle bacilli, yet opportunities for infection after birth are so numerous that post-natal infection seems the more plausible. It is probable that infection of the genito-urinary organs in the male is always by one route, the blood-current, whereby the bacilli are brought from old foci in the cervical and bronchial glands, in lungs, joints, or intestines; the idea that intercourse with a subject of tuberculosis of the pelvic organs can cause the ascent of tubercle bacilli along the male urethra to the prostate is fanciful and entirely devoid of proof.

The liability of the genito-urinary tract to active tuberculosis begins with puberty and is greatest during the succeeding ten or fifteen years; although tuberculous nodules have been demonstrated in the epididymis in children prior to puberty, and in the genital organs of elderly men, yet nearly all cases of genito-urinary tuberculosis first attract attention between the ages of fifteen and thirty

years. Yet since the disease rarely causes pain until the mucous surface of the prostate or bladder is invaded, it may exist for years in the other organs without compelling the patient to seek medical advice.

The lodgment and development of the tubercle bacilli are favored by that ill-defined vice of nutrition that we term hereditary predisposition, by injury, and possibly by gonorrhœal epididymitis; but it must be remembered that genito-urinary tuberculosis may be found in robust, athletic subjects in whose history none of these predisposing factors can be traced—a fact of clinical importance, because we are disposed to associate the idea of tuberculosis with marked cachexia.

The *symptoms* of genito-urinary tuberculosis vary with the site of the infection; in general it may be said that subjective symptoms are slight or absent until the mucous surface of the prostate is involved or until blocking of the ureter occurs. This usual absence of pain and vesical irritation accounts for the frequent failure to seek medical advice until the infection has become quite extensive. The primary focus is found usually in the epididymis, less frequently in the kidney. In the epididymis there can be detected hard nodules, at first small and slowly enlarging until by their coalescence much or all of the epididymis is converted into a hard, painless mass continuing into and finally involving the spermatic cord; the testicle remains long unaffected, but is finally transformed into a similar mass; sometimes one or more nodules soften at an early stage, the skin is perforated, and a persistent fistula remains. Soon after the infection is established in the epididymis it is transmitted to the seminal vesicle and prostate, in which organs the examining finger in the rectum detects distinct hard nodules; extension to the mucous surface causes the symptoms of "cystitis"—pus in the urine and vesical irritability.

Renal tuberculosis may long exist without symptoms other than pyuria, although vesical irritation may occur early. Usually there are no symptoms directing attention to the lumbar region unless the ureter becomes blocked with pus or new tissue; then mild renal colic ensues. This absence of local symptoms is very deceptive; the writer once opened a tuberculous kidney to relieve renal colic due to obstruction; at the patient's death from uræmia ten days later, the opposite kidney—which had never given any symptoms whatever—was found to be a mere sac of tuberculous pus. In another case a patient suffered from severe cystitis with occasional slight renal colic; drainage of the affected kidney completely and immediately relieved the cystitis.

The presence in the pus of tubercle bacilli (which must be carefully distinguished from smegma bacilli) constitutes positive evidence of the nature of the disease; but failure to find them is so common

that the physician should depend largely upon the other diagnostic signs. Since tuberculosis seldom occurs in any of the genital or urinary organs of the male without soon involving the prostate, a digital examination *per rectum* is in the writer's experience the most important diagnostic measure. The cystoscope is useful in determining whether the pus depends from one or both kidneys as well as in discovering tuberculous lesions in the bladder; but it is essential to the diagnosis in comparatively few cases—fortunately, because the irritability of the bladder is usually so great as to render cystoscopic examination very unsatisfactory even with anæsthesia.

Treatment.

Experience has shown that the attempt to cure tuberculosis of the genito-urinary tract by surgery is rarely successful, simply because the aid of the surgeon is seldom sought until the infection has attacked numerous and inaccessible sites. While it is true that in exceptional cases the excision of a tuberculous testicle or kidney, even the resection of the bladder, has effected an apparent cure, yet in general surgical measures are useful merely in removing débris of tissue from the accessible parts—epididymis, testicle, and kidney; the surgery of this infection, at least in the urinary organs, should aim to be palliative, not radical.

Fortunately, medicinal measures are often successful in at least arresting, even in apparently curing, the disease. Such apparent cures are doubtless merely a repression of the infection, for actual extermination of the parasite probably never occurs; the tuberculous, like the syphilitic, infection seems by our present means incurable.

Dry air, sunshine, exercise, good food, and active excretion are exceedingly important; strychnine, arsenic, salicylic acid, and guaiacol are scarcely less necessary. The three drugs first named should be given internally in full doses; 15 minims of guaiacol, mixed with three times as much glycerin or olive oil, should be applied locally to the epididymis and cord, over the bladder or kidney, according to the part affected, two or three times daily; as repeated applications to the same spot cause tenderness and desquamation, the site should be changed daily. Under this treatment the writer has seen cases of extensive, almost hopeless, genito-urinary tuberculosis symptomatically cured without change of climate, and so remain for periods up to five years.

Extension of the infection to the mucous surface of the bladder-neck renders urination very frequent and exceedingly painful; in this condition nuclein solution, prepared by Vaughan's formula and injected into the bladder (1 drachm to the ounce of warm water) mitigates the vesical pain and tenesmus more effectually than do opiates.

PYOGENIC INFECTIONS (CYSTITIS, PYELITIS).

The urinary channels are peculiarly exposed to the entrance of bacteria by way of the blood-current, the urethra, and the rectum. Yet it seems that septic infection of the normal urinary tract does not occur; in other words, that suppuration in this tract is preceded by some impairment of nutrition whereby the natural tissue-resistance is depressed. Many examinations have demonstrated that the normal urinary tract from kidney to prostate is absolutely sterile; and, though the normal urethral surface is known to harbor pus-bacteria, yet they fail to enter its tissues until these have been disturbed by some other agency. When this natural vitality of tissue is lowered by the stagnation of urine and venous congestion resulting from a tight stricture or prostatic enlargement, by the growth of the gonococcus, by a calculus or tumor, then the pus-bacteria—which easily gain access by one of the routes mentioned—may quickly infect a part or the whole of the urinary tract.

In cases of cystitis and pyelitis, therefore, a most important item of treatment is the discovery of the cause—that is, of the local failure of nutrition which renders the tissue unable to resist the pus-bacteria. This cause may be found as an obstruction to the exit of urine or foreign body in the bladder, or it may be a general vice of nutrition such as accompanies gout or spinal disease; sometimes the primary lesion is outside of the urinary tract—a seminal vesiculitis, an appendiceal or perirectal inflammation, etc. Whatever it be, a careful examination of the urinary and pelvic organs should precede the treatment of prostatitis, cystitis, or pyelitis.

Treatment.

The discovery and removal of the cause is the first and often the only necessity in treatment. If for any reason this cannot be done, treatment can only be empirical and palliative, and is often unsuccessful.

The vitality of the tissues is to be increased by hygienic measures, by careful attention to the excretory functions, and by strychnine and guaiacol internally; the so-called urinary antiseptics, especially salol and boric acid, may be given with large quantities of water, and the bladder irrigated daily with a weak solution of silver nitrate (1:5000), which the patient should expel after the catheter is withdrawn, thus bringing the solution in contact with the bladder-neck. The tincture of cantharides, 1 to 3 minims three times daily, is an empirical remedy often of great value in relieving vesical irritation, though it is impossible to predict in what cases it will succeed. The various preparations of nuclein in small doses materially aid the tissues in combating pus-bacteria.

LOCAL DISEASES OF THE MALE GENITO-URINARY TRACT.—URETHRAL DISEASES.

Strictures of the urethra are portions of the canal whose dilatability is less than normal; they have usually been classified as spasmodic and organic. While a "spasmodic" stricture—a narrowing of the channel due to spasmodic contraction of the muscular fibres encircling it—is doubtless possible, at least in the membranous portion, the obstruction often met at the bulbo-membranous junction and ascribed to spasm is frequently due to unskilful handling of the instrument: this is not made to follow the natural curve of the urethra and hence strikes against the firm triangular ligament just behind the bulb. The more skilful in catheterism the surgeon becomes, the less frequently he discovers "spasmodic" stricture.

Organic stricture—a diminution of the normal distensibility of this canal by an overgrowth of the submucous connective tissue—was formerly ascribed to either gonorrhœa or trauma; but it is now known that strictures exist, especially in the anterior half of the urethra, in men who have never had gonorrhœa; some of these at least are congenital and due to the incomplete absorption of the connective-tissue partition which in early fœtal life separates the penile from the glandular urethra.

Organic strictures may be present at any time of life, but are most frequently detected between the ages of twenty-five and forty-five. Strictures are far less troublesome in late than in middle life, possibly from the proneness of the cicatricial tissue composing them to undergo fatty degeneration.

The brilliant work of Otis in proving that the distensibility of the normal urethra is much greater (Nos. 30 to 35 of the French scale) than was formerly supposed, led to the attachment of undue importance to alleged "strictures of large calibre" and to a rather liberal practice of internal urethrotomy for their relief. Later experience has shown that the distensibility of the normal urethra varies greatly in different parts of this canal; that many of the so-called strictures of large calibre are normal structures; and that their division by the knife fails to cure many disorders that were formerly ascribed to them.

In every case of gleet or of disordered micturition, examination of the distensibility of the urethra should be made; indeed, such examinations should be a routine part of the investigation of almost every case of chronic urinary or genital disorder. Narrowing of the urethral canal may be detected by bulbous sounds when the meatus is sufficiently large to permit their introduction; when this orifice is abnormally small (less than No. 22 French) the physician should use a

specially constructed dilating bulb, the urethrometer, which can be introduced closed through the narrow meatus and expanded within the canal; division of the meatus is seldom justified. Bulbous sounds should not be introduced into the membranous urethra; this portion of the canal is explored by the ordinary conical sounds.

Treatment of Strictures.

The restoration of the urethral distensibility is the theoretical object of treatment; but it should be understood that by all methods heretofore employed such restoration is incomplete and transient; for while the symptoms can be abolished, yet an anatomical cure is probably unknown—recurrence of the contraction is to be expected. Hence a young patient with a stricture should be informed that even after apparent cure the contraction is apt to recur in a few years and need a repetition of the treatment; and that such recurrences will probably continue until he has passed the age of fifty-five years. There are two principal methods of treatment of urethral stricture—gradual dilatation and incision (urethrotomy). Gradual dilatation is the ideal treatment, successful in most cases of non-traumatic stricture; it often fails in two classes: 1. Traumatic strictures of the perineal urethra; and 2. Strictures of the glandular urethra—that is, within half an inch of the meatus. The value of gradual dilatation consists not in a direct spreading of the narrow portion, but in the fact that this stretching is followed by a decided congestion of the stretched portion, whose subsidence includes the absorption of some of the fibrous tissue constituting the stricture. The repetition of this process, not oftener than every three or four days, by the successive introduction of conical sounds of gradually increasing size, causes ultimately a more or less complete removal of the strictured tissue.

Urethrotomy, formerly much employed, is now generally reserved for cases in which dilatation is ineffectual because of the extreme hardness or extent of the stricture-tissue. Internal urethrotomy should be restricted to strictures within a half-inch of the meatus; elsewhere the operation is dangerous, the mortality being at least 2 per cent.; and there is great chance of severe hæmorrhage and of urinary infiltration, followed by local abscess, general septic infection, and such destruction of cavernous tissue as to induce, after recovery, a pronounced curvature of the penis when erect.

If an old stricture of the penile urethra be found undilatable, a combined operation—internal urethrotomy and external perineal urethrotomy—should be made; the urine is thus prevented from entering the wound in the penile urethra because drained out through the perineal tube, and the dangers of urinary infiltration are thus avoided.

Undilatable strictures of the membranous urethra should be treated only by external urethrotomy.

Electrolysis.—The effect of a negative current of 8 or 10 milliampères for ten minutes at intervals of three or four days has found some advocates: after much experience the writer considers this method much inferior to dilatation, except in cases of almost impermeable strictures, in which it has repeatedly rendered him valuable service.

Thiosinamin, $\frac{1}{4}$ to $\frac{1}{2}$ grain dissolved in water, three times daily, is a very valuable aid in the absorption of cicatricial tissue in the urethra as elsewhere: after over a year's experience with it the writer considers its use for several months an essential in the satisfactory treatment of hard strictures.

Tight and Impermeable Strictures.—Through the patient's neglect to seek assistance a stricture may so contract as to almost obliterate the urethral canal, permitting the passage of urine only in a very fine stream or even by drops, and causing distention of the bladder. If the subject of such a stricture becomes chilled, or indulges excessively in alcohol, he may suddenly find himself completely unable to void urine. Such strictures are usually amenable to gradual dilatation provided an instrument can be made to pass the narrow portion; this attempt should be made with "whip bougies," which are filiform for several inches of their length and then gradually increase in size to No. 12 or No. 15 of the French scale. When called upon to treat a stricture impermeable to ordinary bougies, especially if there be sudden and complete retention, the surgeon should apply hot water freely to the pelvic region, both externally by baths or fomentations and internally by rectal injections. Olive or castor oil is injected into the urethra and retained by closing the meatus; a whip bougie is gently introduced, the penis being drawn taut so as to obliterate transverse folds of the urethra; the filiform end is gently advanced to the stricture and the minute opening is sought. Sometimes success is immediate; more often repeated trials continued for many minutes are necessary; only gentle pressure should be made, since undue violence may result in puncturing the urethra (making a false passage) or in doubling the filiform end. If the instrument finally enters the stricture it should be passed on until its expanded portion has been forced into or through the stricture, thus enlarging the contracted part at once to a size which will permit the passage of a small bougie. The patient should be warned that the urinary stream may become very small a few hours later, and should be instructed to sit in hot water should he have difficulty in expelling his urine. If all efforts to pass the stricture fail, another attempt may be made on the following day; if the bladder be much

distended it should be relieved by suprapubic aspiration—a measure which frequently facilitates the subsequent passage of the stricture, because it favors the subsidence of urethral œdema. In exceptional cases repeated efforts having failed to open a passage through the urethra, the surgeon must open this canal through the perineum or enter it through a suprapubic cystotomy, in either case catheterizing the urethra from the rear. When the meatus is unduly small, strictures may be stretched by means of special instruments constructed on the umbrella principle and called urethral dilators.

The barbarous and dangerous method of rupturing a stricture, formerly in vogue under the name of "divulsion," should never under any circumstances be employed.

The treatment of stricture may be thus summarized: Gradual dilation is the preferred and usually successful method; internal urethrotomy is often necessary in tight strictures within half an inch of the meatus, and external urethrotomy in tight strictures, especially traumatic, of the membranous urethra; very tight strictures should be rapidly dilated by the whip bougie; intractable strictures of the penile urethra may require combined internal and perineal urethrotomy. The prolonged use of thiosinamin is a valuable adjuvant in promoting the absorption of stricture-tissue.

URINARY FEVER.

The use of instruments in the urethra and bladder, especially when these organs are inflamed, is often followed by chills and high fever—phenomena variously termed urethral, catheter, or urinary fever. These unpleasant symptoms most frequently follow lacerations of the mucous membrane, but can occur when no such laceration is apparent. The clinical course of urinary fever is variable: sometimes all morbid phenomena disappear in a day; sometimes they last for several days; and in some cases, especially in elderly patients, the fever assumes a typhoid aspect and continues until the patient's death some weeks later.

The term "urinary fever" designates several distinct morbid conditions. These are—

(1) Intoxication through lacerations of the mucous membrane with poisonous substances from the urine or from the mucous surface;

(2) Infection of the blood-current with septic bacteria through such laceration;

(3) Infection of the urinary channels—bladder, ureter, and kidney—with septic bacteria, constituting a suppurative cysto-pyelitis;

(4) Acute congestion of the entire urinary tract following the change in pressure caused by the sudden withdrawal of the urine in cases of chronically distended bladders; this condition is usually indicated by hæmaturia; and

(5) (Probably) a reflex nervous action.

The *avoidance* of urinary fever should be attempted by—

1. Gentleness of all instrumental manipulation, whereby the chance of lacerating the mucous membrane is diminished.

2. Careful irrigation, through a soft catheter, of urethra and bladder before metal instruments are introduced; and

3. In cases of chronically distended bladders, such as accompany prostatic enlargement and tight strictures, the physician should be careful, when called upon to introduce the catheter for acute retention or other cause, never to evacuate the bladder completely at the first sitting; a portion only of the urine should be withdrawn, and the bladder gradually emptied by repeated catheterism during several days.

4. Urinary antiseptics, such as salol and boric acid, may be administered in 5-grain doses every four hours for a few days before and after urethral instrumentation. The value of such measures is problematic, and the surgeon should not place the least dependence upon the avoidance of infection thereby, nor be lulled into omitting any of the far more important local measures to the same end.

PROSTATE AND APPENDAGES.

THE prostate, its utricle, the seminal vesicles, and the dilated extremities of the vasa deferentia (called ampullæ) are, like the uterus and tubes of the female, enclosed in a thin fibro-muscular sheath which I have called the "broad ligament of the male." Infections and suppurative processes usually extend from the prostate to the seminal tubes and often to the enclosing fibrous sheath; hence we may, for brevity's sake, speak of the diseases which affect the prostate, utricle, and vesicles collectively as affections of the "prostate and appendages."

Acute inflammation of these organs is caused usually by the gonococcus-infection, occasionally by the internal administration of cantharides, capsicum, or other irritant, possibly by gout.

The chronic infections are gonorrhœal, tuberculous, and septic.

The chronic septic infections of the prostate and seminal tubes, when not gonorrhœal, are caused by urethral instrumentation, caustic urethral injections, by extension of a chronic urethritis due to tight

stricture of the deep urethra, by extension from a cystitis, by prostatic calculi, and by horseback and bicycle riding. They are favored by the chronic venous congestion of the pelvic organs which is so common in middle and advanced life as the result of constipation, alcohol-drinking, high living, lack of exercise, and excessive sexual indulgence.

The symptoms are dull pain in the suprapubic region, rectum, perineum, and sometimes in the glans penis, often aggravated by jolting or sitting on upholstered chairs; there is often pain in the sacral region (which the patient usually ascribes to his kidneys). Urination may be unduly frequent and be followed by the escape of a viscid grayish or watery fluid (from the prostatic glands) which the patient considers semen; sometimes there is a continuous slight discharge of similar fluid from the meatus—"prostatorrhœa;" sexual desire may be decreased and the normal sensation diminished or even absent; ejaculation may be premature and erection feeble; the patient is often extremely despondent. This is really the condition of incipient impotence, leading ultimately to loss of virility; indeed, until questioned, the patient may complain of the sexual symptoms only.

Examination with the forefinger (enclosed in a rubber condom) reveals a sensitive and swollen condition of the prostate or vesicles, or both; gentle milking of these parts causes the appearance at the meatus of considerable fluid.

The TREATMENT should begin with the removal of the cause of the trouble when this is practicable, such as the dilatation of a stricture. The local measures directed especially to the prostate and appendages have been already described in the discussion of Chronic Gonorrhœa. The despondency of the patient should not be ignored nor ridiculed; a cheerful prognosis and tonics are useful.

ENLARGEMENT (HYPERTROPHY) OF THE PROSTATE.

The frequent condition so called includes two anatomical states: 1. A diffuse enlargement of the prostate; and 2. Localized tumors of its glandular and muscular tissues, which project into the bladder. The diffuse enlargement is certainly often the result of the process just described—chronic inflammation of the prostate and vesicles; the local tumors may result from and accompany this inflammatory condition, or may arise as do tumor-formations in general. They are found in many cases of enlarged prostate, though their presence cannot usually be recognized until the bladder is opened, because they grow into the vesical cavity and cause no change in the rectal surface of the gland, which alone is accessible to the examining finger; they can sometimes be seen through the cystoscope.

Prostatic enlargement is a disease of the second half of life; it often begins before the patient becomes fifty years old, but does not

usually cause him to seek a physician's advice until several years have elapsed; indeed, the derangement of the urinary function is so gradual that the patient often ignores it until some pronounced symptom of advanced disease, such as complete retention of urine, startles him.

A patient over forty-five years of age who complains of any urinary derangement should be examined *per rectum;* undue size of the prostate should lead to the passage of a clean soft catheter immediately after urination; a flow of residual urine (which should be stopped at a few ounces) shows that the voluntary evacuation of the bladder is incomplete and that the familiar train of distressing phenomena incident to advanced prostatic disease threatens the patient.

The examiner must now exclude other morbid conditions which may give rise to the symptoms of cystitis, prominent among which are vesical calculus, tumor, tuberculosis, and prostatic cancer. Calculus can generally be recognized by the sound, tumor by the cystoscope, tuberculosis by the nodular thickening in the seminal vesicles, prostate, and epididymis; and prostatic cancer by the uneven, nodular hardness of the prostate, the enlargement of inguinal lymph-glands, hæmaturia, and emaciation of the patient. It should be remembered that the chronic retention of urine resulting from prostatic enlargement favors the formation of vesical calculus, which is an exceedingly common—and often overlooked—sequence of this condition.

Treatment of Prostatic Enlargement.

The treatment is general and local; personal hygiene, including good digestion, regular and easy defæcation, warm clothing, exercise, avoidance of cold and of excesses in eating and drinking, is very important; the patient should drink three pints or more of pure water daily; in cases where marked hardness of the prostate indicates fibrous tissue, thiosinamin—half a grain in water after each meal, continued for weeks—is a valuable remedy.

Local treatment endeavors to reduce the congestion and œdema of the prostate; to promote evacuation of the bladder; and to prevent or arrest septic infection of the urinary passages. To this end there are three principal means—the milking of the prostate and vesicles by the finger in the rectum, previously described; the free use of hot water as baths, irrigations of the bladder, and rectal enemata; and the passage of a large sound once a week If septic infection of the bladder-neck, shown by pus in the urine, already exist, the prostate and bladder should be irrigated with a weak solution of silver nitrate (1 : 5000) or of sodium chlorate (1 : 100) twice a week.

In the later stages the patient must be taught to evacuate the

residual urine by a catheter once or twice daily. The soft Nélaton catheter will usually enter the bladder; if it fail, the stiffer *coudé* instrument of Mercier, commonly called the prostatic catheter, generally succeeds; metallic instruments and those armed with a stylet easily lacerate the urethra and are seldom needed. All instruments used in prostatic cases should be scrupuously clean; they can be made and kept so by immersion in a 2 per cent. solution of formalin.

It is highly important that the prostatic urethra as well as the bladder should be washed by the irrigating fluid; this is accomplished by withdrawing the catheter until the eye has receded one or two inches from the bladder before the fluid is injected; after the injection the catheter can be pushed back until the outward flow begins. Many of these patients readily learn to inject the bladder from the meatus without using a catheter—a method sometimes advantageous.

Internal medication has hitherto proven of little benefit in these cases; but the writer can recommend the continued use of sodium salicylate, 10 grains three times daily, and of thiosinamin, $\frac{1}{4}$ to $\frac{1}{2}$ grain three times a day, as serviceable; the latter remedy has an undoubted influence in diminishing the fibrous tissue always present in greater or less degree.

In advanced cases certain complications arise which may render surgical interference inevitable; these are complete retention, persistent cystitis of great severity, and such distortion or stenosis of the prostatic urethra as renders catheterism very difficult or painful.

Complete retention is a serious event; when called to such a case the physician should observe three rules of great importance: 1. Never to use force nor lacerate the urethra—that is, to use only flexible instruments; 2. To observe strict aseptic precautions as to instruments and urinary channel; and 3. Never to empty the bladder completely at the first catheterism.

The patient suffering from complete retention should have a hot water enema, followed by a $\frac{1}{4}$-grain morphine suppository; a hot hip-bath or fomentation should be used for a quarter or half an hour, the patient then warmly covered in bed, the hips being elevated above the shoulders. The anterior urethra is irrigated with hot water injected with warm, clean oil; a clean soft catheter, No. 10 or 12 English scale, is filled with the oil and introduced, the penis being drawn firmly forward; steady pressure often forces the instrument into the bladder; if this effort fail an elastic prostatic (Mercier) catheter should be tried; if no false passage exists this instrument can always be made to pass the prostatic obstruction without injury. If, however, the urethra is already lacerated by the previous use of metal instruments the difficulties of catheterism are enormously increased; even then the Mercier instrument is to be preferred,

though occasionally a metal catheter of large diameter and long curve may be used; but force must be scrupulously avoided, for no one can know the direction of the distorted and swollen prostatic urethra, and forcible catheterism results only in false passages, profuse hæmorrhage, and a trying situation.

In cases which have been thus forcibly handled, suprapubic aspiration is sometimes inevitable; the needle should be entered at right angles with the spine about an inch above the upper border of the symphysis, half of the estimated contents of the bladder withdrawn, hot fomentations again applied, and the patient kept in bed for some hours; the relief of bladder-tension and the reduction of prostatic œdema thus secured may result in easy catheterism at the next attempt, or even in voluntary urination; but should retention persist and catheterism remain impossible, aspiration must be superseded by one of the methods of operative relief.

Should the physician succeed in introducing the catheter, he should not at once evacuate the bladder completely: sufficient urine should be withdrawn to give the patient complete relief, and an ounce or two of some antiseptic solution injected; in the course of a few days the bladder may be thus gradually emptied. Even with the greatest care some fever usually follows complete retention requiring the use of the catheter, yet the ill effects are minimized by the measures described. Persistent cystitis of high grade, and difficult catheterism from prostatic distortion, must often be relieved by surgical measures.

Operative Treatment.—Surgical treatment comprises three operations: Drainage of the bladder, prostatectomy, and castration.

1. *Drainage of the bladder*, by either perineal urethrotomy, suprapubic cystotomy, or a combination of the two, is the simplest, safest, and surest method of temporary relief; the suprapubic is superior to the perineal incision because of the greater command of the bladder-cavity afforded by it. Drainage of the bladder may be temporary or permanent; in many cases the cystitis and inflammatory swelling entirely subside in two or three weeks, after which the tube may be removed and the wound permitted to heal; the patient may then enjoy years of freedom from urinary discomfort. In other cases where the prostatic enlargement and distortion are found to be so great as to render a speedy return of the urinary difficulties probable, the artificial opening may be made permanent by having the patient wear constantly a rubber or silver tube, which is removed daily for cleansing. The permanent fistula has, however, fallen into disfavor, having been supplanted by the following operations:

2. *Prostatectomy*—the removal through combined suprapubic and perineal incisions of projecting outgrowths of the prostate and the restoration of a low-level channel from bladder to urethra—has

become a standard operation. The prostatic tumors, when pedicled, are removed by scissors, snare, or cautery; when imbedded in the prostate they are enucleated through either the suprapubic or perineal opening: large masses of prostatic tissue can thus be removed with surprisingly small damage to the mucous lining of the bladder. The hæmorrhage is usually slight and easily controlled by hot water and packing with iodoform gauze; the prostate is thoroughly stretched by the finger, and any bar at the vesical orifice freely incised. The mortality of this operation, at first 25 per cent., is now in skilful hands reduced about one-half; the results range from a complete restoration of the urinary function on the one hand to merely an increased facility of catheterism on the other; the prognosis varies, of course, with the patient's general condition as well as with the previous duration of bladder atony.

3. *Castration*, the removal of both testicles—a plan suggested by the frequent atrophy of uterine fibroids after the removal of both ovaries—has been extensively practised during the last four years for the relief of sufferers from prostatic hypertrophy. In a considerable percentage of the cases already reported great relief from cystitis has been secured, and in some the power of voluntary urination has returned; in a smaller number more or less complete failure to secure any benefit whatever has been the result; in some instances double castration has been recommended and even performed in cases where an undiscovered stone was subsequently found to be the cause of the trouble; for it is sometimes impossible to detect by the sound a calculus hidden in a pocket of the bladder.

This operation, the mortality from which rivals that from prostatectomy, has been most frequently successful in cases where the prostatic enlargement was soft and inflammatory rather than hard and fibrous—that is, in cases of the same sort as are relieved by simple drainage of the bladder. The unquestioned fact that a vesical calculus, tumor, or tuberculosis may escape detection by an expert surgeon renders it apparent that double castration should be performed only after a digital exploration of the bladder has been made; and the drainage following such exploration will often accomplish all that could be hoped for from castration.

Ligature of both vasa deferentia has been found to afford much relief in some cases of prostatic hypertrophy; since it is a relatively slight (although not absolutely safe) operation, free from the æsthetic objections to double castration, it may be substituted for the latter as a purely tentative procedure.

To summarize: When surgical interference becomes necessary it should consist in temporary drainage of the bladder with stretching of the prostatic urethra; if this exploration reveals such distortion

and overgrowth of the prostate as renders a cure by simple drainage improbable, the surgeon must be prepared to make either a prostatectomy, a ligation of both vasa deferentia, a double castration, or a permanent fistula—according to the condition and previously ascertained preference of the patient.

Cancer of the Prostate.

Cancer of the prostate, including carcinoma and sarcoma, is a not infrequent disease, occurring chiefly in patients under ten and over fifty years of age; while most of these tumors are found on histological examination to be carcinoma, the clinical distinction is often impossible and always unimportant.

The symptoms of primary prostatic cancer are hæmaturia, pain, and cystitis; the bleeding occurs without apparent provocation and is intermittent; pain is felt in the rectum, perineum, and thighs, especially after urination; cystitis may be long delayed. The diagnosis is in the early stages difficult, cancer being often indistinguishable from the more frequent hypertrophy of the prostate; the most important and constant diagnostic signs are progressive emaciation and pallor; hard enlargement of lymph-glands in the groins, pelvis, and Scarpa's triangle; and irregular nodular enlargement of the prostate. Cancer is often grafted upon senile hypertrophy; the discovery of recognizable cancer-tissue in the urine, or the detection of a malignant ulcer through the cystoscope, is conclusive evidence. In elderly men the disease lasts several years; in children death ensues in a few months.

The treatment of prostatic cancer is only palliative; for, although the cancerous prostate has been extirpated several times, the patients who survived the operation have all died of recurrence within a few months. Pain may be mitigated by morphine; cystitis, hæmorrhage, and urinary retention treated symptomatically; and when other measures fail to relieve the vesical distress a permanent suprapubic exit for the urine may be made by puncture with a trocar, through whose canula a soft rubber catheter is introduced.

DISEASES OF THE BLADDER.

Cystitis.

Cystitis is a bacterial infection of the bladder; the pyogenic bacteria (especially the colon bacillus), the tubercle bacillus, and the gonococcus are the species concerned.

Pyogenic bacteria are incapable of infecting a normal bladder—a

statement proven by experiment and illustrated by the frequent harmless introduction of unclean catheters and sounds. When, however, the nutrition of the bladder is impaired, as by a calculus, prostatic enlargement, or deep urethral stricture, the pus-microbes—gaining easy access from rectum, urethra, and blood-current—infect its walls, producing the inflammatory reaction which we call cystitis. Hence this disease, when neither tuberculous nor gonorrhœal, is a secondary, not a primary, morbid condition.

The classical symptoms of cystitis—frequency and pain in urination and pyuria—really indicate inflammation of the prostatic urethra rather than of the bladder; but they may be caused by an irritation of the renal pelvis, such as stone or tuberculosis, and by seminal vesiculitis; they should therefore not be considered to warrant a diagnosis of cystitis; in fact, the differential diagnosis as to the cause of these symptoms is sometimes impossible without the cystoscope.

The TREATMENT of cystitis endeavors to discover first the location and second the cause of the morbid condition producing the symptoms: the site of the lesion may be the bladder, the prostatic urethra, the renal pelvis, the seminal vesicles; the antecedent morbid condition may be gonorrhœa, a tight stricture of the deep urethra, prostatic enlargement, stone or tumor in the bladder or prostate, tuberculosis of the genital organs, or perirectal abscess. Since these conditions require widely different treatment, it is evident that there is no treatment applicable to cystitis in general beyond the removal of the cause. When this is impossible the patient's suffering may be diminished by the internal administration of demulcents—buchu, hamamelis, etc.; by washing the deep urethra and bladder with hot water containing silver nitrate (1 : 5000), sodium chlorate (1 : 200), or by the injection into the bladder of liquid vaseline; lesions of the spinal cord and constitutional conditions such as gout and lithiasis must not be overlooked.

TUMORS OF THE BLADDER.

These may be divided into three classes: papilloma, fibroma, and cancer; they occur oftener in males than in females, and mostly in the second half of life. They usually give rise, at some stage of their growth, to three symptoms—hæmorrhage, pain, and cystitis. Bleeding from a tumor is often distinguished by three features: its occurrence independently of exercise, indeed frequently during sleep; its abundance, perhaps filling the bladder with clots; and its increasing frequency. The pain of a vesical tumor accompanies malignant rather than benignant growths, and tumors of the trigonum rather than those more remotely situated; cystitis is a common though often a late result of a bladder tumor.

There are but two positive diagnostic signs whereby a vesical tumor is distinguished from calculus and tuberculosis—the appearance in the urine of fragments of the growth, and ocular detection by the cystoscope. The degree of malignancy of the growth is likewise often problematical: a tumor in a young patient, causing much bleeding and no pain, is generally a benignant papilloma; a tumor in an old person, causing severe and radiating pains, is usually malignant; between these two extremes are many cases in which the degree of malignancy can only be conjectured, even when fragments are found in the urine or caught in the eye of a catheter; transformation from benignancy to malignancy certainly occurs in some bladder tumors; operative removal, when incomplete, seems to hasten this change.

In every case of obscure bladder disease the interior of the organ should be inspected through the cystoscope. Tumors will usually be found at or near the trigonum; papillomata can be easily recognized as slender, warty growths, similar to the pointed condylomata of the external genitals; fibromata are less easily distinguished from the folds of mucous membrane; cancerous growths are usually sessile tumors, whose surfaces may be ragged, ulcerated, or papillomatous; this latter feature has led to confusion of the malignant tumors with the benignant papillomata. The distinction between them exists in the base rather than in the surface of the growth; though the color of this surface is often distinctive, the benignant tumors being pink and the malignant gray.

Treatment is palliative and radical. The bleeding may be controlled by the internal administration of turpentine oil, 3 to 5 drops on sugar or in emulsion three to five times daily, and by injecting into the bladder a 1 per cent. solution of sodium or potassium chlorate; pain is controlled by morphine, and cystitis by the treatment already suggested. In favorable cases (as determined by the cystoscope), the tumor may be excised through a suprapubic cystotomy; the results of such excision have been often favorable for benignant, but unsatisfactory for malignant growths, for in the latter class the complete removal of the dense base is often impossible even with resection of the bladder-wall; and incomplete removal seems to accelerate the malignant infiltration.

In general, vesical growths which have infiltrated the bladder-wall, as revealed by the finger in the rectum or after excision in the bladder, are not suitable for radical operation; those, on the other hand, whose bases are normal tissue, can be removed with a fair prospect of cure, or at least of long freedom from recurrence. Even in cases of cancer a suprapubic incision may be needed for the arrest of hæmorrhage or for the relief of cystitis by the establishment of a permanent fistula.

KIDNEY, PELVIS, AND URETER.

THE upper urinary passages are subject to three bacterial invasions—gonorrhœal, septic, and tuberculous; and to the formation of calculi and tumors.

PUS-INFECTION; PYELITIS (SURGICAL KIDNEY).

The various pyogenic infections are sequels of gonorrhœa, chronic septic infection of the bladder (chronic cystitis) such as results from prostatic enlargement, vesical calculus, and tight stricture of the deep urethra; they may also result from catheterism in the puerperal state. Less frequently septic infection of the kidney and its pelvis comes from the blood-current, as a complication of general infections, such as typhoid fever, diphtheria, etc.

Acute pus-infection of the upper urinary passages is marked by chills, fever, pain over the kidney and along the course of the ureter, down the thigh and in the corresponding testicle, which may be retracted; it is, however, more often a chronic disease, and is then a gradual process whose symptoms may be masked by the more prominent signs of coexistent cystitis.

TREATMENT aims to arrest the cystitis of which the pyelitis is often the extension, by the careful dilatation of a urethral stricture, the removal of a vesical calculus, etc. In cases of severe cystitis and pyelitis from prostatic enlargement, simple drainage of the bladder for a few weeks may be followed by a cessation of the inflammation in the upper urinary channel. The internal administration of nucleinic acid and of sodium salicylate, and the external application of guaiacol in full medicinal doses are important adjuncts in treatment. In women the ureter can be catheterized and irrigation of the ureter and kidney-pelvis made with hot water containing hydrastine muriate (saturated solution) or other local antiseptic.

The differential diagnosis between pus-infection, tuberculosis, and calculus of the renal pelvis often taxes our present means of diagnosis. In every case of pyelitis the physician should make a microscopic examination of the urine, noting pus, blood, crystals, and bacteria; then with the cystoscope it can be seen from which ureter the pus issues; and from the conspectus of symptoms a diagnosis of greater or less certainty is made. Yet, after most careful and thorough examination and confident diagnosis, competent surgeons have opened the kidney and found their conclusions erroneous.

MOVABLE AND FLOATING KIDNEY.

Abnormal mobility of the kidney is congenital or acquired; the movement may take place behind the peritoneum (from laxity of the

renal attachment) or within the abdominal cavity (from the enclosure of the kidney in a distinct envelope of peritoneum, a mesonephron). The former, the movable kidney, is far more frequent than the latter, the floating kidney; although this anatomical distinction is not often clinically practicable until the kidney is exposed. Movable kidney is found usually in women, especially in those who have borne several children; but it is not rare in men.

The symptoms vary from almost nothing to a degree of pain that incapacitates the patient for active bodily movement—a dragging sensation in the abdomen which may be aggravated by movement, standing, constipation, or menstruation into a sharp pain resembling renal colic, and perhaps accompanied with nausea. Upon palpation with the patient in various positions a tumor can usually be discovered corresponding in size and shape with the normal kidney, located anywhere in the abdomen or pelvis, and generally capable of reposition in the normal locality when the patient's hips are elevated.

The treatment endeavors to retain the kidney in its normal position, either by a truss (which often fails, especially in fleshy patients) or by nephrorrhaphy (nephropexy).

TESTICLE AND EPIDIDYMIS.

Acute inflammation of these organs is due to gonorrhœa, septic infection, trauma, or the general infection of mumps, typhoid fever, or other acute bacterial diseases. The essentials of local treatment are hot fomentations, the application of guaiacol (15 minims, dissolved in three times that quantity of glycerin), three times daily, and the thorough suspension of the inflamed organ against the symphysis, by means of a jockey-strap or similar bandage enclosing cotton and oiled silk, next the skin.

The chronic diseases are all accompanied by enlargement of these parts, and the differential diagnosis is therefore a comparative study of these enlargements.

Tuberculosis usually begins in the epididymis as hard, nodular swellings like shot, later coalescing into a cord; the tuberculous tissue may become adherent to the skin, soften and ulcerate, making an obstinate sinus. Digital examination *per rectum* usually shows a similar condition of the seminal vesicles and prostate.

Syphilis on the other hand usually attacks first the testicle, making a smooth, painless enlargement and not involving the prostate.

Cystic disease is a slow-growing, painless tumor, the fluid nature of which can be established by the aspirating needle.

Chronic epididymitis and orchitis may cause great enlargement of these organs, which are usually painful and sensitive to pressure; abscess and cyst-formation may occur.

Cancer of the testicle (carcinoma and sarcoma) is most frequent in the second half of life, and can sometimes be distinctly traced to a blow. In the early and slow stages there may be no positively distinctive feature from the cystic and inflammatory enlargement, but the active stage is marked by rapid growth, constant pain, induration of the inguinal and pelvic lymph-glands, and finally emaciation and cachexia.

The treatment of these several conditions has been previously suggested.

DISORDERS OF INSEMINATION.

The function of the male in reproduction is the deposit of motile spermatozoa on the cervix—insemination. Defects in this function are called impotence and sterility, the former implying inability to copulate, the latter (when not caused by impotence) the absence of moving spermatozoa from the semen.

Impotence and Sterility.

Impotence.—When not resulting from malformation, inability on the part of the male to copulate is caused by either imperfect erection or premature ejaculation. Normal erection consists in the distention of the cavernous and spongy bodies with blood, which is brought about by the dilatation of the penile arteries and the constriction of the venous exits; and this in turn results from the contraction of the perineal and penile muscles stimulated through branches of the second sacral nerve from the genital centre in the lumbar cord. This centre responds to stimulation from either the brain or the nerve-endings distributed in the penis from prostate to glans; hence erection may be induced through excitement of this centre by sexual thoughts, or by influences from the periphery such as friction of the glans, congestion of the prostatic urethra by a distended bladder (morning erections), etc.; the genital centre may also be directly stimulated by certain drugs taken into the blood such as cantharides and alcohol. Ejaculation of semen is accomplished by the same apparatus stimulated to a higher degree, resulting in a contraction of the genital muscles, which begin in the fibres of the broad ligament, and continues through the prostate and perineal compressors.

Feebleness or absence of erection may therefore be caused by any one of the following factors: 1. Depression of the genital centre by the brain, from fear, grief, anxiety, disgust; 2. Depression of the

genital centre through imperfect nutrition, as in diabetes mellitus; 3. Diseases of the spinal cord, such as ataxia and myelitis; 4. Exhaustion of the genital centre by excessive sexual activity, whether in intercourse or masturbation; 5. Disease of the nerve-endings in the genital tract, especially the prostatic urethra, caused by inflammation —the commonest form of impotence. This chronic inflammation of the prostate results usually from gonorrhœa or from sexual excess.

The subject of this form of impotence often complains of pain in the sacrum, suprapubic region, perineum, and testicles; anxiety and despondency are marked features. A diagnosis can be made by a digital examination of testicles, prostate, and seminal vesicles; gentle pressure ("milking") of the latter organ often causes the appearance of a milky fluid at the meatus.

The TREATMENT of impotence will naturally be determined by the cause; excluding cases of diabetes, spinal-cord disease, etc., the treatment is mental and local. The false and terrifying ideas which the patient has probably derived from the perusal of quack literature should be corrected and a cheerful prognosis given. The local treatment is that for chronic inflammation of the prostate and appendages already described—milking of these organs, deep injections of weak silver-nitrate solution, alternating hot and cold sponging of the perineum and external genitals, and pills of camphor monobromate; strict limitation of sexual excitement, mental and physical diversion and hygiene are important. The prognosis varies with the age of the patient and the cause of the impotence; the most favorable cases are those due to gonorrhœa in the young. Direct stimulation of the sexual organs by drugs should be avoided, though strychnine, arsenic, iron, and phosphates may improve the general condition.

Sterility.—Failure to fertilize the female may be due either to inability to deposit the seminal fluid in the cervix (impotence) or to the absence of moving spermatozoa from that fluid (sterility proper); the latter may exist when the power of copulation is unimpaired. In these cases no spermatozoa whatever are found in the semen (azoospermia), or the spermatozoa emitted are nearly or quite motionless; this absence of motion, entailing sterility, may be due to a chronic inflammation in some part of the seminal tubes, especially prostate and vesicles.

The TREATMENT of sterility depends upon the cause: if the freshly passed semen, received in a condom, contains no spermatozoa, treatment is useless unless a double epididymitis exist, in which case daily massage of the indurated tissues with mercurial ointment should be made for several weeks. If spermatozoa be present, though lacking motility, the usual treatment for chronic inflammation of prostate and vesicles should be made.

Involuntary Seminal Discharges.

These occur in two ways: 1. *Nocturnal emissions*; 2. *Spermatorrhœa*.

Seminal emissions with the natural orgasm, occurring during sleep and with an erotic dream, are experienced by healthy, continent men at intervals of ten to thirty days; when not followed by languor or sacral pain they may be considered compatible with health. Emissions occurring at short intervals and followed by lassitude and pelvic pains commonly arise from abnormal excitement of the genital tract, such as follows habitual masturbation, sexual excitement without gratification, or the extension of a gonorrhœal infection to the prostate and vesicles. Treatment should include instruction in the hygiene of the sexual organs, especially the avoidance of ungratified sexual excitement in every form and sexual excess. Monobromate of camphor, two grains night and morning, will usually lengthen the intervals between nocturnal emissions by decreasing the excitability of the genital centre in the cord; if congestion of the prostate and vesicles exist it should be reduced by the passage of large cold sounds, the hot and cold perineal douche, deep injections of silver nitrate solution, milking of the parts, etc.

Spermatorrhœa should mean the involuntary escape of seminal fluid without orgasm; while it may occur under sexual excitement, it is usually observed merely at the close of defæcation or urination. Under the latter circumstances the fluid pressed out at the meatus, though resembling semen, often contains no spermatozoa, being in fact merely prostatic secretion; and the condition should be called *prostatorrhœa*. Yet, whether it contain spermatozoa or not, the habitual appearance of this fluid indicates a chronic inflammation of the genital organs, which should be treated by the measures already recommended for that condition.

GENERAL NOTES.

Diagnostic Notes.

Pain.—Pain in the urethra, especially in the fossa, is a common symptom of inflammatory affections of the prostate; pain in the sacral and suprapubic regions often accompanies chronic inflammation of prostate and vesicles; these latter conditions may also cause pain referred by the patient so distinctly to the rectum that he assumes the existence of disease in the bowel. Pain in the lumbar region, extending along the ureter to the testicle, indicates an irritation of the kidney-substance or of the renal pelvis, and may be caused by a calculus, tuberculosis, or partial obstruction of the ureter (from stricture or kinking).

Pyuria.—The detection of the source of pus in the urine—an accompaniment of many diseases of these organs—sometimes taxes the physician's diagnostic power; for, aside from the anterior urethra, any part of the urinary channel and either of the seminal vesicles may be the origin of the pus which is present in the urine. In a general way the three-glass test, already described, may indicate the source; but the specific site and cause of the suppuration may require a careful weighing of all symptoms and even inspection of the bladder and ureteral orifices through the cystoscope. No inferences can be properly drawn from the gross appearances of the pus nor of the accompanying epithelium, unless this be the atypical fragment of a malignant tumor.

Hæmaturia.—The source of blood mixed with urine can usually be detected with reasonable certainty; in general it proceeds from either prostate, bladder, or kidney. Bleeding from the prostate usually arises from conditions, such as cancer and tuberculosis, which are recognizable by the finger in the rectum; bleeding from the kidney is often symptomless, while hæmorrhage from the bladder often proceeds from morbid conditions that are preceded or accompanied by great vesical irritability. Yet in many cases positive knowledge as to the source of hæmaturia must be obtained through the cystoscope, whereby not only the vesical cavity but also the orifices of the ureters can be inspected.

Albuminuria.—Albumin may appear in the urine independently of nephritis in any condition which causes frequent spasmodic contractions of the bladder, such as acute prostatitis, tuberculosis, or tumor near the vesical orifice. The escape of albumin from the renal vessels seems to result from the increased pressure in the tubules resulting from undue contraction of the lower end of the ureters. With the subsidence of the vesical irritation albumin disappears from the urine.

Vesical Irritation.—Frequent and more or less painful urination indicates really an irritation of the prostatic urethra rather than of the bladder; it may be due to a morbid condition which does not involve the bladder, but is located at any point of the urinary channel from meatus to renal pelvis, or even in the seminal vesicle; at times, too, it may result from the presence of acrid substances in the urine without local disease of the urinary passages. It is a frequent symptom of tuberculosis of the renal pelvis, of stricture of the ureter, and of seminal vesiculitis.

Fever.—The thermometer should be used as a routine part of urinary diagnosis: an irregular temperature may be an important factor in distinguishing between various conditions, such as the tuberculous and the septic infections of inaccessible parts like the kidney.

Digital Examination per Rectum.

This is essential in the case of every patient seeking relief from disease of the urinary or genital organs; it reveals important morbid conditions of prostate and vesicles, and materially assists the exploration of the bladder by a sound. The disagreeable features of such examination are largely obviated by enclosing the finger in a rubber condom, which is then anointed with glycerin (rubber dissolves in fats).

The Cystoscope.

The electric cystoscope of Nitze or Leiter, or one of the later modifications of this instrument, is a most valuable, sometimes essential, means of diagnosis. Some diseased conditions can be detected only by its aid; in others the cause of symptoms can be identified and located only by the same instrument. It is therefore required for the recognition of primary vesical tuberculosis and tumors; for detecting the source of vesical hæmorrhage; for differentiating between renal and vesical hæmaturia or pyuria; for ascertaining whether one or both kidneys are the seat of a suppurative process; and for deciding whether an apparently normal kidney is secreting its proper share of urine. In addition it is often useful in the detection of encysted and pocketed stones inaccessible to the sound, and in the visual location of foreign bodies: through the modified instruments of Casper and Nitze the ureter has been catheterized in the male. In short, in many cases of obscure urinary disease the cystoscope is indispensable.

There are, however, certain limitations to its use: prominent among these is the extreme sensitiveness of the bladder which renders that viscus incapable of retaining the minimum quantity of water essential to cystoscopic examination, namely, four or five ounces; this condition results most frequently from tuberculosis of the bladder or prostate, and from acute septic conditions—all of which would be injured by any instrumentation; profuse bleeding into the bladder renders satisfactory cystoscopic examination impossible through the rapid obscuration of the visual field. Aside from these cases there are but few in which cystoscopic examination cannot be made in the adult even without anæsthesia; through this instrument the physician can inspect the surface of the bladder and may find an unsuspected stone, tumor, or ulcer as the cause of previously unexplained symptoms; he can observe not only the absence of pus or blood from the stream issuing from each ureteral orifice, but also note possible swelling around that orifice (often indicating ureteritis and pyelitis); and by counting the jets of urine from each ureter he can make a fair estimate as to the relative amount of fluid secreted by each kidney: this item may be of great importance when a surgical operation on either kidney is contemplated.

The Urethroscope.

Of the many instruments devised for the purpose of rendering the urethral surface accessible to the eye, but three types deserve mention: 1. The simple cylindrical tube through which light is reflected from a head-mirror; 2. The electric urethroscope, the incandescent lamp in which is carried either at the outer or the inner end of the tube; 3. The aëro-urethroscope (devised by Antal and improved by Fenwick), by which the urethra is inflated with air during the inspection. The last-named method gives the only satisfactory view of the urethra, but it can be used for obvious reasons only in the penile portion; for the inspection of the deep urethra one of the other instruments must be employed. In a limited number of cases the urethroscope is most valuable: certain cases of gleet dependent upon localized diseased areas, and cases of morbid sensations due to similar areas and to polyps, can be cured only through the aid afforded by this instrument; yet it must be admitted that these cases are not numerous.

Catheterism of the Ureters.

The aid in both diagnosis and treatment to be derived from the introduction of a catheter into the vesical orifice of the ureter has long been apparent, and for many years different means to that end have been devised; only recently, however, has catheterism of the ureter become entirely practicable in the female and possible in the male. By the method of Kelly and Pawlik the introduction of a special catheter into the ureter of the female can now be accomplished, usually without anæsthesia. By greatly elevating the hips of the patient, the bladder becomes distended with the air which enters through a tube 40 mm. or more in circumference, which is introduced after the urethra has been gradually dilated by conical plugs. Light reflected from a head-mirror reveals the ureteral orifices, into which a delicate catheter or sound can be passed; and elastic bougies can be made to traverse the ureter to the pelvic brim, sometimes even to the renal pelvis.

By this method the urine from each kidney can be separated from that of its fellow as well as from admixtures furnished by the vesical surface—the diagnostic advantages of which are apparent; moreover, strictures of the ureter are detected and even dilated; and it has been found possible to flush the renal pelvis itself.

In the male the ureter can often be catheterized by the aid of special cystoscopes, notably that of Casper; yet the mechanical difficulties due to the presence of the cystoscope materially limit the practical results of this measure.

Therapeutic Notes.

Tincture of cantharides, in 1- to 3-minim doses, often exhibits a marked influence in quieting vesical irritation ("cystitis") as well as in decreasing congestion of the sexual organs (chordee, nocturnal emissions). This is empirical (and uncertain) therapeutics.

The Chlorates.—The chlorate of potassium, or better, the same salt of sodium, has a pronounced soothing and hæmostatic effect upon the mucous membrane of prostate and bladder. A watery solution of sodium chlorate, 2 to 10 per cent., injected into the bladder, is a most efficient agent for arresting vesical hæmorrhage from any cause, including cancer and papilloma, as well as for soothing the inflamed surface in any case of cystitis where the cause cannot be removed.

Codeine may be advantageously substituted for morphine for the relief of vesical irritation.

Cocaine should be used in the urethra with extreme caution, if at all; the record shows a surprisingly large number of cases of toxic effects from simple surface applications.

Guaiacol.—The anti-pyogenic and anæsthetic effects of this drug find a wide application in the treatment of genito-urinary diseases. As a local application (one part to three of glycerin or olive oil) it is valuable in the treatment of epididymitis, whether gonorrhœal, septic, or tuberculous; and in cystitis and pyelitis. Administered by the mouth, especially when combined with salicylic acid, which dissolves readily in it, guaiacol has a demonstrable value in limiting pyogenic processes in any part of the genito-urinary organs. In watery solution (1 : 200) it may be advantageously used in combination with hydrastine as a urethral injection in purulent urethritis from any cause.

Nuclein.—The various preparations supposed to depend for their activity in part at least upon nucleinic acid—Vaughan's solution, thyroid extract, protonuclein—have a decided, though varying, effect in combating septic and tuberculous infections; they should be given internally, and when practicable applied locally.

Silver Salts.—Certain salts of silver, especially the citrate and lactate, have demonstrated their efficacy as local means for combating septic infection, and have been used in watery solution (1 part to 500 or more of water) for irrigating pus-cavities and the urethra.

Thiosinamin, made from mustard oil by the action of ammonia, is a thoroughly reliable agent for the gradual removal of cicatricial tissue. In $\frac{1}{4}$- to $\frac{1}{2}$-grain doses, dissolved in alcohol and water, three times daily for weeks together, it causes a perceptible absorp-

tion of the fibrous tissue of strictures, prostatic fibroids, and cicatrices.

Turpentine oil is the best internal hæmostatic, especially for renal bleeding: it should be given in 1- to 3-drop doses, on sugar or in emulsion, every three hours.

Hydrastine, applied as a saturated solution of the muriate, is an exceedingly efficient agent in arresting the suppuration of gonorrhœa.

DISEASES OF THE EYE AND THEIR TREATMENT BY THE GENERAL PRACTITIONER.

By CASEY A. WOOD, M. D.

GENERAL CONSIDERATIONS.

In recent years experience has to some extent modified the views that were once held as to the value of that long list of remedies which the surgeon had come to regard as necessary in the treatment of ocular affections. Our faith in the efficacy of many of them has, it is true, been confirmed, but in the case of others either we do not employ them to the same extent as formerly or we do not use them at all. This attitude proceeds from the conviction that results supposed to flow from the exhibition of the older remedies may be obtained by other, simpler, less expensive, or less painful means, or that more harm than good is done by employing them in ophthalmic practice.

As to the remedial agents that have appeared during the past four or five years, some will probably be retained as being specially effective in the treatment of eye-diseases, but, just as in other departments of medicine and surgery, certain agents at first loudly and authoritatively recommended, not having stood the test of time and experience will eventually be consigned to the oblivion they deserve.

Finally, new applications of old remedies are being constantly advised.

In these pages particular attention will be paid only to those drugs and appliances of recent vogue that seem to be most effective.

Cleansing of the ocular structures as a preliminary to operations is regarded as of greater importance than ever. Elaborate experiments have shown that—(1) It is practically impossible to absolutely sterilize the conjunctival sac, the lachrymal passages, the eyelashes, or the lid-margins. (2) When powerful antiseptics are employed with this object in view the vascular disturbances set up by them largely neutralize any good that the resulting antisepsis may have brought about. (3) The most effective and least injurious agents are those that, acting mechanically, remove the pathogenic organisms, reduce their numbers, and weaken their power for evil. Thus, copious irrigations of the eye with mild sterilized aqueous mixtures with formalin (1 : 5000–

3000), or of solutions of common salt, boric acid or sodic bicarbonate, or with sterilized water alone, are much to be preferred to the employment of strong mercuric chloride, iodide, or cyanide solutions, although these latter are much more potent as bactericides.

Wilson of Detroit advises the following preliminary precautions:

1. The skin surrounding the eye should be well cleansed with sterile, neutral soap and water.

2. The eye should be thoroughly irrigated with a warm 1 per cent. solution of common salt.

3. The instruments are to be immersed in boiling water for a few seconds and then wiped dry with a soft sterilized towel.

4. The operation should be made as rapidly and accurately as possible.

5. The wound should then be irrigated with salt solution; and

6. The subsequent dressings sterilized by heat only.

7. When possible do not disturb the dressings until primary union has occurred.

8. The patient's general health should receive the utmost attention before, during, and after the operation.

DISEASES OF THE CONJUNCTIVA.

Inflammation of the conjunctiva is of special importance because, in its various forms, it is the commonest disease of the eye. In the majority of instances this inflammation is due to infection by pathogenic micro-organisms and their toxins. No doubt mechanical abuse, vasomotor disturbances due to changes of temperature, dust, smoke, and wind predispose to attacks, but bacterial invasion stands as the exciting cause of this as well as of many other inflammatory diseases of the eye. Recent investigations have shown that even the healthy conjunctiva, the lid-edges, the cilia, and the palpebral skin are a favorite resting-place for some thirty kinds of microbes, including almost all the organisms, innocent and pathogenic, that infect the rest of the body. The moment the resistance of the tissues is sufficiently reduced there is always at hand a supply of these agents ready to set up a conjunctivitis of some kind or other.

The importance of the differential diagnosis between certain common inflammatory affections of the ocular structures, especially between acute conjunctivitis, acute iritis, and acute glaucoma, cannot be overestimated. To mistake one of the last two of these diseases for a conjunctivitis is to be a party to the production of blindness in the patient under observation, and yet such a fatal error is not uncom-

monly made. The accompanying table of symptoms will assist the practitioner in his efforts to treat successfully any of these acute inflammations:

Acute Conjunctivitis.	Acute Iritis.	Acute Glaucoma.
Pain: Little or none. Foreign-body sensations.	Severe, supraorbital pain, getting worse toward night.	Very severe and neuralgic in character. Is referred chiefly to the supraorbital branches of the fifth nerve. The scalp of the affected side often feels sore to the touch.
Discharge: Mucous and mucopurulent, or as flakes of lymph.	Profuse and watery.	Scanty, and fluid in character.
Vision: Not affected, or only slightly impaired.	Affected from the first.	Greatly impaired. Halos appear about lights. Foggy vision.
Pupil: Reacts promptly to light and accommodation. Presents the normal size and appearance.	Contracted; sluggish, or immovable.	Widely dilated and motionless.
Photophobia: None.	Always more or less marked.	Present, but not so marked as in iritis.
Disease affects: Both eyes in the majority of cases.	Often one eye only.	Usually one eye only.
Change in iris: No change in color or other appearance.	Discoloration, with loss of velvety gloss. Sometimes lymph-deposits on its surface.	Loses its brilliant gloss.
Posterior synechiæ: None.	Commonly present.	None, unless secondary iritis has occurred.
Injection of bulbar vessels: Coarse congestion of vessels.	Fine pericorneal injection.	Congestion of the episcleral veins as well as pericorneal injection.
Lachrymation: Little or none.	Abundant flow of tears.	Not so marked as in iritis.
Morning adherence of lids: Almost invariably occurs.	None.	None.
State of conjunctiva: Swollen, opaque, and roughened.	Slightly hyperæmic, but transparent in early stage of disease.	Slightly hyperæmic palpebral conjunctiva.
Cornea: Unaffected.	Rarely hazy.	Hazy; anterior chamber shallow.
Intraocular tension: Normal.	Rarely much increased.	*The eyeball is decidedly harder than normal.*
Tenderness on pressure: None.	Marked.	Often absent.

Catarrhal conjunctivitis, also known as simple, acute, or mucopurulent ophthalmia, is best treated by simple and non-irritant applications, particularly when there is discomfort, pain, or photophobia present.

Gentle irrigation with weak solutions has been generally recommended in recent years and its results are often quite marked. The reservoir of the irrigator is filled with the warmed and sterilized fluid and placed not more than a few inches above the head of the recum-

bent patient. A steady stream, directed from one canthus to the other, flows over the diseased parts into a pan placed to catch it. The following are the solutions commonly employed:

Formalin,	3 minims (0.20);
Sterilized water,	1 quart (1000.).

The eye to be gently irrigated four times daily. Apply to the lid-edges at night:

Calomel,	$1\frac{1}{2}$ grains (0.10);
Lanolin,	150 " (10.).

Another:

Sodic chloride,	75 grains (5.);
Sterilized water,	1 pint (500.).

Still another:

Sodic biborate,	
Boric acid,	of each 4 drachms (15.);
Boiled water,	1 pint (500.).

A very useful one when much pus is secreted is—

Chlorine water,	12 drachms (50.);
Sterilized water,	1 quart (1000.).

In the later stages of the disease the following is of value and should be dropped into the eye three times daily:

Antipyrin,	7 grains (0.40);
Distilled water,	$2\frac{1}{2}$ drachms (10.).

When there is much mucous discharge nascent argentic iodide has been highly recommended. This is made from—

I.	Potassic iodide,	50 grains (3.32);
	Distilled water,	50 minims (3.60);
	Pure glycerin,	100 minims (6.50).
II.	Silver nitrate, crystallized,	50 grains (3.56);
	Distilled water,	50 minims (3.50);
	Pure glycerin,	100 minims (6.50).

Mix 2 drops of solution II. with 3 drops of solution I. and brush the conjunctiva of the averted lids thoroughly with the freshly precipitated silver iodide.

Another mixture that acts very nicely when there is much secretion present is *finely powdered thioform* (dithyosalicylate of bismuth), flecked with a camel's-hair brush upon the cleansed conjunctiva lining the lids. Gallicin, dusted into the eye in the same way as the preceding and for the same purpose, has been recently advised, but this agent causes considerable pain and should not be used unless the eye has been previously cocainized.

When the mucous membrane is rough and secreting freely, it may be touched lightly, after cleansing, by means of borated cotton wound on a probe or wooden toothpick, saturated with the following:

Mercuric cyanide,	15 grains (1.);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

This should be immediately washed off with distilled water.

Panas has lately advised the following to be used as a lotion in the second stage of simple acute conjunctivitis:

Beta-naphthol,	15 grains (1.);
Alcohol, enough to dissolve this in	
Distilled water,	1 quart (1000.).

It should be freely applied with a medicine-dropper.

A moderate irrigation of the conjunctival sac may be obtained by using a large pipette, and a number of useful agents may be thus applied to the inflamed surfaces in this disease. A very effective solution for this purpose is—

Sodic sulphate,	75 grains (5.);
One p. ct. sol. common salt,	8 ounces (250.).

This should be instilled, when quite warm, four or five times daily.

In every case of catarrhal conjunctivitis a simple ointment should be applied to the lid-margins at night, to be washed off in the morning. One of the best of these is—

Lanolin,	3 drachms (12.);
Oil of almonds,	
Distilled water,	of each $\frac{1}{2}$ drachm (2.);
Attar of rose,	1 drop.

Purulent conjunctivitis, most commonly observed as *ophthalmia neonatorum* and *gonorrhœal ophthalmia*, is best treated in the early stages by soothing applications and iced gauze.

The strictest cleanliness of the internal ocular structures should be observed. *Cerebral irrigation of the sac with mild antiseptic solutions*

constitutes the most effective adjunct to other forms of treatment. To touch the cornea with the irrigating tube, camel's-hair pencil, cotton wads, or fingers is to invite ulceration of the cornea and blindness. Both surgeon and nurse should exercise the greatest care and gentleness in opening the lids and applying the remedies. Frequent cleansings are better than strong caustics.

So far as drugs, in the stage of profuse discharge, are concerned, the mixture recently introduced by X. C. Scott is recommended:

Hydrastine sulphate,	
Boric acid,	
Borax,	of each 5 grains (0.35);
Tincture of opium,	½ drachm (2.);
Distilled water to make up	1 fluidounce (30.).

Mix and filter.

To be instilled into the eye frequently.

Instead of using silver nitrate, Hoor and others recommend argentamin (ethylendiamin-silver-phosphate) as having greater powers of penetration and as being consequently more effective than the nitrate. A 5 per cent. solution is to be thoroughly brushed over the everted lids as often as is desired. Hoor says of it, after many experiments, that the result of treatment was at least what might have been expected from silver nitrate, but that it should be used in solutions from three to five times stronger than the lunar caustic. He further claims that it possesses all the advantages of silver nitrate and none of its disadvantages; it may be applied in the presence of corneal complications, and is even well tolerated in inflammatory states of the iris and ciliary body. Like most other salts of silver this phosphate preparation should be kept in a dark bottle.

When Buller's shield (a watch-glass set in a window made in a patch of adhesive plaster and applied so that the former comes directly in front of the sound eye) is used to prevent infection, the purulent discharge is still more effectively shut out if a thin strip of absorbent cotton be moistened with collodion and attached over the edge of the plaster.

Reich-Hollender advises a lotion and cold compresses of

Chlorhydrate of quinine,	15 grains (1.);
Distilled water,	3 ounces (90.).

To be used as an adjunct to other treatment, especially after the eye has been thoroughly irrigated with some of the weak lotions previously mentioned as being valuable in the catarrhal form of conjunctivitis.

When the swelling and vascular injection of the lids have some-

what subsided instillations of the following may be made with advantage:

Tannin,	23 grains (1.50.);
Distilled water,	5 drachms (20.).

Heinz advises, instead of the offensive iodoform, that *finely powdered dermatol* (basic gallate of bismuth) be blown upon the everted lids, or be applied in the pencil form.

The following mixture has recently been employed in France as an irrigating fluid—as soon as the discharge becomes profuse. It is not intended to be used alone, but is more efficacious as a bactericide than the simple solutions mentioned under the heading Simple Catarrhal Conjunctivitis:

Labarraque's liquid,	30 minims (2.);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

Like other irrigating liquids it should be used warm—twice a day.

Kalt has had considerable experience with calcic permanganate, which he considers effective and non-irritating. He advises 1 gramme to 3 litres of water at 25° C. One eye to be irrigated with one-half of this two, three, or four times daily, as required. One or two additional irrigations with warm sterilized water may also be employed.

When pain is present ten drops of the following may with advantage be added to any of the irrigating fluids used in the treatment of this serious disease:

Extract of opium,	15 grains (1.);
Glycerin,	
Distilled water,	of each 30 minims (2.).

Ten drops are to be added to each litre of the fluid in the irrigator.

Browne has had signal success in treating conjunctival blenorrhœa with the following solutions, and he has found that they act quickly and satisfactorily:

I.	Magnesic trichlorophenolate,	15 grains (1.);
	Distilled water,	$3\frac{1}{2}$ ounces (100.).
II.	Magnesic trichlorophenolate,	30 grains (2.);
	Distilled water,	$3\frac{1}{2}$ ounces (100.).

As soon as the stage of suppuration sets in, irrigation of all the parts in the conjunctival sac (especially *under* the lids) should be made twice a day with solution II. As the swelling and discharge subside

somewhat this should be continued with solution I. The irrigations should be kept up for a quarter of an hour on each occasion.

Finally, in conjunction with the application of silver salts directly to the diseased conjunctiva, there is probably no better irrigating fluid than—

Formalin,	$\frac{1}{2}$ ounce (15.);
Distilled water,	$1\frac{3}{4}$ pints (800.).

This mixture is non-irritant and is a very active destroyer of pyogenic bacteria.

Trachoma, or true granular lids, must of course be treated with reference to its complications, and to the form of the disease. Above all, it must not be forgotten that the acute manifestations of this formidable affection are usually aggravated by astringents recommended in the chronic forms. In the acute exacerbations of the common form of the disease, where a considerable discharge is noted, the modern treatment is that of simple acute conjunctivitis. Iced compresses soaked in—

Boric acid,	
Borax,	of each 75 grains (5.);
Rose-water,	$2\frac{1}{2}$ drachms (10.);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

should be applied five or six times daily until the ocular discomfort is allayed. Exuberant granulations are best treated by expression with Knapp's forceps. Affixed to the ends of the blades of these are small creased rollers, removable for sterilizing purposes. The conjunctiva is grasped between the rollers and the follicles are effectually squeezed without damage to the mucous membrane. When this is done any of the classic astringent remedies, preferably the *lapis divinus*, may be applied to the diseased surfaces.

Sattler, of Prague, prefers *dialysed tannic acid* (*i. e.* tannin free of gallic acid) to be dusted upon the trachomatous surfaces daily.

When the lids do not show small hard granulations and there is no marked pannus, massage of the lids upon the globe with certain ointments will be found to be of signal advantage. Either of the following may be employed in this way:

Mercurous oxide,	45 grains (3.);
Vaseline,	1 ounce (30.).

Mix thoroughly in a mortar and gently massage the eyeball once every day or so.

Dilute citrine ointment, made with brown cod-liver oil (instead of the official lard oil),	1 ounce (30.);
Brown cod-liver oil	2½ drachms (10.).

To be mixed with the aid of gentle heat and allowed to stand exposed to the air, but protected from dust, for a week before using. This is a smooth, semi-liquid salve, which should be introduced into the conjunctival sac on the point of a probe and used exactly like the foregoing.

When corneal complications are present, especially pannus, a watery solution of creolin has been strongly recommended:

Creolin,	15 grains (1.);
Distilled water,	3½ ounces (100.).

To be dropped into the eye twice a day alternately with 1 : 400 solution of mercuric chloride.

Diphtheria of the conjunctiva is not uncommonly seen in association with the same disease of the throat and nose, and its diagnosis should, as in suspected diphtheria elsewhere, be confirmed by the usual bacteriological examinations. Where the Klebs-Loeffler bacillus is isolated full doses of the appropriate antitoxin must be employed. This has been done with the best results.

Nicati has recently advised—

Loretin (derived from quinolin),	
Calomel,	of each 15 grains (1.);
Finely powdered boric acid,	2 ounces (50.).

This is dusted upon the infected surface while the lids are similarly treated; the whole to be covered with a sterilized cotton dressing.

Chronic catarrhal conjunctivitis sometimes follows one or more acute attacks, but is as often, perhaps, kept up by some form of eye-strain which, when possible, should be relieved. The subsequent treatment should be a soothing one. Carter advises that a few drops of the following mixture be instilled into the eye twice a day, to be followed by one drop of a 1 : 300 zinc sulphate solution:

Boric acid,	3½ grains (0.20);
Cocaine muriate,	1½ " (0.10);
Distilled water,	1 ounce (30.).

Massage of the lids upon the ball with equal parts of glycerin and distilled water is of considerable value. A small quantity of the fol-

lowing may also be employed in the same way, once a day, if it does not cause too much irritation. In the latter case the proportion of iodol is to be decreased:

Iodol,	30 grains (2.);
Vaseline,	$2\frac{1}{2}$ drachms (10.).

Follicular conjunctivitis must not be mistaken for trachoma, chiefly because the treatment of the former disease is simple and successful, while true granular lids, due to the invasion of the deep structures of the conjunctiva by a specific microbe, is very difficult to dislodge and its ravages so often affect the other ocular tissues. In the acute stage the enlarged follicles should be treated by iced compresses saturated with 1 per cent. solution of common salt. These applications should be made four times a day for ten minutes at a time. In the chronic form, as well as when the acute symptoms have subsided, Trousseau advises the instillation, twice a day, of two drops of the following:

Zinc chloride,	$\frac{1}{6}$ grain (0.01);
Distilled water,	75 minims (5.).

In addition to these, gentle massage of the lid upon the eyeball may be made, once every two or three days, with this ointment

Iodol,	30 grains (2.);
Vaseline,	
Lanolin,	of each 75 " (5.);
Attar of rose,	1 drop.

DISEASES OF THE LIDS.

Blepharitis marginalis is the name usually applied to a number of affections of the lid-edges that present quite different pathological pictures. Clinically, however, they may be divided into the ulcerative, eczematous, squamous, and hypertrophic.

As a rule, the majority of these yield readily to treatment. Concomitant eye-affections, especially diseases of the conjunctiva and lachrymal apparatus, should be carefully looked after. The probable existence of eye-strain should not be forgotten. The general health is not uncommonly at fault.

The following preparation of ichthyol is of signal value in most forms of marginal blepharitis:

Sulpho-ichthyolate of ammonium,	$1\frac{1}{2}$ grains (0.10);
Lanolin,	$2\frac{1}{2}$ drachms (10.).

To be applied to the borders of the lids once or twice a day.

In the squamous variety Gradle advises, to be used in the same way:

Ichthyol,	$7\frac{1}{2}$ grains (0.50);
Zinc ointment,	$2\frac{1}{2}$ drachms (10.).

Where the points of insertion of the eyelashes into the lid-margin are plainly seats of any form of the disease, these cilia should be extracted before rubbing in the salve.

In the ulcerative form Fuchs advises that the following application be smeared on a compress of fine linen and the whole fixed upon the affected eye, over night, with a bandage:

White precipitate,	$2\frac{1}{2}$ grains (0.15);
Vaseline,	$2\frac{1}{2}$ drachms (10.).

In addition to this treatment the cup-shaped and ulcerated depressions that often form in this variety of the disease should be touched, once daily, with a 20 per cent. solution of argentamin. When crusts or scales adhere to the lid-margins these should be gently removed after soaking them half an hour with borated cotton wet with sterilized hot water. In rebellious cases the ulcers may be curetted and then have applied to them this solution:

Mercuric iodide,	15 grains (1.);
Pure olive oil,	8 ounces (250.).

Mix with the aid of a gentle heat, and filter.

In eczematous blepharitis the following mixture is useful, but it must be remembered that it discolors the lashes:

Hydrogen dioxide,	1 ounce (30.);
Vaseline,	5 drachms (20.);
Lanolin,	$2\frac{1}{2}$ " (10.).

In cases where the lid-edges are red and irritable a very good wash, to be applied for five minutes at a time three or four times daily, is—

Lanolin,	
Gum arabic,	of each 75 grains (5.);
Boric acid,	15 " (1.);
Distilled water,	$3\frac{1}{2}$ ounces (100.);
Extract of violet,	10 drops.

This should be followed, just before retiring, by smearing the edges of the lids with—

Calomel,	$\frac{1}{3}$ grain (0.20);
Lanolin,	$2\frac{1}{2}$ drachms (10.).

In the simple hypertrophic form Gradle advises a mixture of resorcin and sulphur:

Milk of sulphur,	
Resorcin,	of each 15 grains (1.);
Vaseline,	1 drachm (4.).

A small quantity is to be applied to the lid-margins at night. In the same way may be employed this ointment:

Aristol,	15 grains (1.);
Vaseline,	
Lanolin,	of each 75 grains (5.).

The following formulæ are valuable in the squamous variety:

Birch oil (oleum rusci),	
Olive oil,	of each equal parts.

To be applied with a cotton swab.

Beech-nut oil,	
Olive oil,	of each equal parts.

To be applied in the same manner.

Styes.—Although these painful inflammatory affections of the glands supplying the lid-margin are often due to general ill health, it must not be forgotten that the exciting cause is frequently eye-strain, to be relieved only by the wearing of glasses or the correction of anomalies of the external ocular muscles. The most recent additions to the list of drugs used in their local treatment are the following:

Mercuric iodide,	7 grains (0.40);
Olive oil,	$3\frac{1}{4}$ ounces (100.).

Dissolve with the aid of heat and filter.

This should be applied several times daily to the incipient stye. A salve, to be used in the same way and for the same purpose, is—

Mercuric iodide,	$\frac{1}{3}$ grain (0.02);
Vaseline,	$2\frac{1}{2}$ drachms (10.).

When repeated attacks have occurred, the lid-edges should be thoroughly smeared, every day for three months, with—

Aristol,	$7\frac{1}{2}$ grains (0.50);
Vaseline,	
Lanolin,	of each 75 " (5.).

Lanvole recommends for this purpose, also, bathing the lids regularly with—

Salicylic acid,	76 grains (5.);
Borax,	45 " (3.);
Distilled water,	10 drachms (300.).

Or with—

Ammonium chloride,	15 grains (1.);
Precipitated sulphur,	45 " (3.);
Spirits of camphor,	5 drachms (20.);
Rose-water,	$1\frac{1}{2}$ ounces (50.).

DISEASES OF THE LACHRYMAL APPARATUS.

Dacryo-cystitis—an inflammation of the mucous membrane lining the tear-passages, especially of that of the tear-sac—may be acute or chronic, simple catarrhal or purulent. An obstruction, due either to swelling of the mucous membrane or to an organic stricture, is usually present, preventing the flow of tears into the nose. Nasal catarrh, as productive of dacryo-cystitis, should be borne in mind. Remedies (usually operative procedures) should, consequently, be resorted to for the purpose of relieving this latter condition, while various solutions, applied with the lachrymal syringe or forced into the sac (Gould) with the tip of the forefinger, may be relied upon to reduce the swelling in the mucosa and to relieve the other inflammatory symptoms. The regurgitation of muco-pus from the lachrymal into the conjunctival sac is a common cause of catarrhal *conjunctivitis*, and that fact should be remembered in all cases of chronic catarrh of the lids.

Thomalla advises the following mixture, under the name "rhinalgin," as a suppository, twice a day, in each nostril:

Alumol,	$\frac{1}{6}$ grain (0.01);
Ol. valerian,	
Menthol,	of each $\frac{3}{8}$ " (0.6);
Cocoa butter,	15 grains (1.0).

The following solution may be injected into the sac and tear-passages in chronic cases:

Aluminium acetate,	45 grains (3.);
Distilled water,	$2\frac{1}{2}$ drachms (100.).

The irrigator is of great value in catarrhal diseases of the tear-passages, and if a blunted hypodermic needle be attached to the irrigating tube the lachrymal sac may be washed out even through the intact puncta lachrymalia. When a canaliculus has been slit, for the purpose of introducing probes or for enlargement of the passage, lavage of the diseased parts can be more readily accomplished. For this purpose there is no better irrigating fluid than—

Formol,	15 grains (1.);
Distilled water,	2 quarts (2000.).

After irrigating with a boric acid solution a small quantity of this mixture may be injected into the sac:

Antipyrin,	37 grains (2.50);
Distilled water,	$2\frac{1}{2}$ drachms (10.).

If the purulent catarrh be very marked, and particularly if it be complicated with abscess of the sac, an effective irrigating fluid is—

Potassic permanganate,	15 grains (1.);
Distilled water,	8 ounces (250.).

Duclos prefers to this a 50 per cent. solution of fluorol, which he finds much less irritating. Irrigation may be preceded by a cleansing injection of equal parts of hydrogen peroxide and water or by a 4 per cent. solution of sodic bicarbonate.

Where a fistulous opening remains after the bursting of a lachrymal abscess it may be closed by cauterization of the abnormal passage. This is well done by carrying a probe-end, armed with a little cotton dipped in lactic acid, well into the depths of the fistula. A superficial slough forms, is cast off, and the opening closes. Lately steresol (a compound resembling collodion) has been used to form a covering over the opening. This may be repeated as often as is necessary.

Chalazion (*retention cyst of a Meibomian tubule*).—Many authors have lately contended that strain of some portion of the ocular apparatus may, by producing hyperæmia of the lid-structures, causes these little tubules to be closed and the secretion of their corresponding

glands to be retained. Apart from surgical intervention the condition giving rise to chalazia requires consideration. Massage with a simple stimulating ointment is nearly always of value in preventing stenosis of the remaining ducts in multiple cysts of this character. Darier recommends the following formula for this purpose—to be applied once daily:

Neapolitan ointment (French codex),	2 drachms (8.);
Potassic iodide,	15 grains (1.).

A simple and effective agent, for massage, is—

Lanolin,	90 grains (6.);
Oil of almonds,	
Rose-water	of each 15 " (1.).

Chemosis of the Lids.—This is usually a sign of local lesion (black-eye, acute conjunctivitis, ulcer of the cornea) but may be due to cardiac disease. In any event it may be relieved by a single dose, daily, of—

Quinine sulphate,	4 grains (0.25);
Freshly powdered digitalis leaves,	2 " (0.10).

DISEASES OF THE CORNEA.

Inflammations of the various structures of the cornea may be confined, in considering their etiology, to the area occupied by this membrane, but as a rule corneal inflammations form a part of processes affecting other portions of the eye, or are merely signs of general dyscrasiæ. Belonging to the latter class are two diseases almost entirely confined to children, viz. *phlyctenular keratitis* and *specific infiltration of the cornea.*

Phlyctenular Keratitis.—Among the various causes of this disease is acute nasal catarrh, especially the hypertrophic variety; indeed, this disease of the nose, which was at one time spoken of as a common accompaniment of the ocular affection, is now regarded as the origin of the micro-organisms (especially the *coccus flavus desidens*) that subsequently find lodgment in the conjunctiva and cornea.

In the treatment of phlyctenules of the cornea, associated with the same lesions in the bulbar conjunctiva, general hygiene, particularly in strumous subjects, is of the first importance. Indeed, there are few instances where purely local treatment is of much avail, because, if

the nose or the systemic condition be neglected, one may confidently expect either a very slight improvement of the eye-symptoms or an early recurrence of the infection.

When the phlyctenules have reached the stage of ulcer each one may be touched with a match-end dipped in—

Benzo-phenonide (apyonin)	15 grains (1.);
Distilled water,	7 drachms (100.).

Then a bandage for four hours. This solution instilled into the sac, three or four times a day, is also advised:

Boric acid,	
Borax,	of each $\frac{1}{2}$ drachm (2.);
Rose-water,	$\frac{1}{2}$ ounce (16.);
Distilled water,	$1\frac{1}{2}$ ounces (45.).

Mydriatics are very useful in phlyctenules of the cornea. Instead of atropine, scopolamine (1 grain to 2 ounces of water) is effective.

Another lotion, especially when there is conjunctivitis, is—

Mercuric chloride,	15 grains (1.);
Distilled water,	5 quarts (5000.);
Alcohol,	q. s.

This is more effective when employed, three times daily, with the irrigator.

As soon as the acute symptoms have subsided the globe may be gently massaged, once a day, with—

Ammonium sulpho-ichthyolate,	$1\frac{1}{2}$ grains (0.10);
Vaseline,	
Lanolin,	of each 75 " (5.).

This salve makes a useful application to the lid-margins (at night-time) and to the eczematous patches on the face that so frequently accompany the corneal and conjunctival eruption.

Interstitial Keratitis.—*Parenchymatous, syphilitic, specific*, or *strumous* disease of the cornea is merely local evidence of a constitutional disorder. It runs such an extremely chronic course and so invariably ends in more or less complete resolution that it is difficult to say what part treatment has had in determining a successful cure.

Anti-syphilitics should always be administered in cases where the specific disease, apart from the eye-lesion, is plainly marked. However, even when, in the course of months, the cornea has regained

most of its transparency the patient may be found to be almost blind from disease of the ciliary body, choroid, or optic nerve. When mercury is employed it is best administered in the shape of inunctions—two grammes daily of lanolin and blue mass, equal parts. Grandclément claims that when there are no acute symptoms and the globe is not sensitive to pressure a cure results in from forty to ninety days, from massage of the eyeball daily, every two hours, with the following mixture:

Phenol,	15 grains (1.);
Liquid vaseline,	$3\frac{1}{2}$ ounces (100.);
Oil of wintergreen,	a few drops.

If this produce pain the eye should be cocainized before the next application. As an internal remedy the following pleasant mixture, in doses of from one to two desertspoonfuls, may be used:

Potassium iodide,	5 ounces (159.);
Glycerin,	1 ounce (30.);
Mercuric iodide,	$1\frac{1}{2}$ grains (0.10);
Syrup of quinine (Fr. codex),	6 ounces (200.);
Anisette (Bordeaux),	$3\frac{1}{2}$ " (100.).

Hypodermic injections, repeated every two days, may be given instead of inunction, as follows:

Mercuric chloride,	$1\frac{1}{2}$ grains (0.10);
Sodic chloride,	15 " (1.);
Distilled water,	3 drachms (10.).

Ten to fifteen minims once daily.

For the prevention of posterior synechiæ, rotoin (from *Scopolia japonica*) is useful where atropine is contraindicated. By some authors it is claimed that this glucoside is preferable to the mydriatics usually instilled, as it does not irritate the lids even when employed for several weeks or months. A good formula is—

Rotoin,	1 grain (0.05);
Cocaine muriate,	$1\frac{1}{2}$ grains (0.10);
Distilled water,	1 ounce (30.).

Punctate keratitis, the so-called serous iritis, is usually a sign of chronic intraocular disease and should be treated accordingly. Darier has recently suggested for it the internal administration of colchicin, and gives the following prescription:

Crystals of colchicin,	1 grain (0.06.);
Sugar of milk,	1 drachm (4.).

Make into 60 granules and give from 1 to 3 daily, gradually increasing the dose until stomachic colic, or other signs of intolerance, appears. It is better to administer this remedy on alternate weeks.

Ulcers of the Cornea.—These may, for clinical purposes, be divided into two classes: (1) The simple, non-spreading ulcer; (2) The serpiginous or spreading variety. Both lesions are usually the result of an erosion or wound (however slight) with subsequent infection. The character and number of the micro-organisms, the resisting powers of the invaded tissues and the extent and situation of the corneal traumatism determine the severity of the disease.

Simple ulcer is usually small, single, and of a grayish-white appearance, and may be accompanied by considerable photophobia, lachrymation, and pain.

Spreading ulcer is a much more serious disease, although its beginning may be the same. Especially when the supply of pyogenic bacteria, from a purulent ophthalmia or dacryo-cystitis, is large and vigorous, widespread and rapid destruction of the cornea may result. It is hardly necessary to say that this fact should always be borne in mind when treating the corneal lesion. In all varieties of ulceration of the cornea irrigation of the conjunctival sac is of paramount importance, whether this remedy be employed before or after direct applications to the ulcer itself, or whether it be used solely as a curative measure. In the simple variety Joenicke's boro-borax is very effective. This is made by dissolving equal parts of boric acid and borax in water, boiling, and allowing the product to crystallize. A warm 10 per cent. solution may be used for irrigation. Under the name of *antipyonin*, disodic dodecaborate, a similar compound, has been recommended, in the same dose and to be used in the same manner, by Rolland. Antipyonin is also used, instead of boric acid, as an application, in the form of fine powder, to the conjunctiva in the suppuration which often accompanies corneal ulcer.

A very effective cautery of the ulcer may be accomplished by means of lactic acid. After thorough cocainization a pointed wooden tooth-pick is dipped into a 30 per cent. solution and carefully and thoroughly applied to the diseased area. A small slough separates in the course of a few days. Galezowski uses, instead of lactic acid, for cauterizing the ulcer, a 1 per cent. mixture of gold carbolate. In the same way one may apply to the ulcer, and with the best results, a few crystals of the sozoiodolate of zinc. This forms a white eschar which does not spread beyond the limits of the diseased surface. The application may be repeated, as the cauterization is not a deep one and leaves a very slight scar, or it may be followed by gentle massage, once a day (Goldzieher), with—

Sodic sozoiodolate,	8 grains (0.50);
Neutral atropine sulphate,	1 grain (0.05);
Vaseline,	2 grains (10.).

A few drops of a solution of rotoin or scopolamine should be instilled every three or four hours, when the ulcer is centrally situated and there is pain or other acute symptoms. Where atropine is indicated Jackson advises the following collyrium:

Neutral sulphate of atropine,	
Cocain muriate,	of each 1 grain (0.05);
Distilled water,	2 drachms (8.).

One drop of this at a time.

Large disks, made with gelatin and iodoform, to be carefully applied to the cocainized eyeball and followed by an antiseptic bandage, have been recommended, but these are painful and seem to possess little advantage over dusting the surface with finely powdered iodoform. Vacher has employed an eye-wash of a watery solution (1 : 250) of potassic permanganate. Di Vincentiis advises the employment of subconjunctival injections of sodic chloride and mercuric chloride in spreading ulcer complicated with hypopyon (pus in the anterior chamber). In the majority of instances a single injection is all that is necessary, but in the worst cases two or three doses, at intervals of one or two days, may be required. De Wecker has quite lately given very explicit directions for the employment of this remedy. He believes that when properly carried out there is no agent more prompt in effecting a cure of all forms of corneal ulcer. The eyelashes are first disinfected with a 1 : 100 solution of mercuric oxycyanide, and the conjunctival sac is then thoroughly irrigated with a 4 per cent. solution of boric acid. Fifteen drops of the following solution are now injected beneath the conjunctiva as near the ulcer as possible:

Mercuric chloride,	$\frac{1}{4}$ grain (0.015);
Eserine salicylate,	1 " (0.05);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

This should be repeated daily, if necessary, but the dose should be diminished as soon as improvement is noticed. Each injection should be followed by an antiseptic bandage. When iritis is present scopolamine should be substituted for the eserine.

As most of these subconjunctival medications are painful they have sometimes added to them a small quantity of cocaine. Dolganoff claims that a 1 per cent. solution of paraclorophenol in water forms

an analgesic injection that acts quite as quickly as the mercurial salt, and that the pain following it is slight and lasts only a few minutes.

When simple ulcer of the cornea is associated with a chronic conjunctivitis, dacryo-cystitis or blepharitis, massage, once a day, with either a mixture of europhen ($\frac{1}{2}$ to 1 per cent.) or aristol (1 per cent.), with equal parts of vaseline and lanolin, will be found efficacious.

Where simple ulcer of the cornea does not promptly heal it may be touched with a 1 : 10 solution of iodine trichloride, the sac being subsequently irrigated, twice a day, with 1 : 1000 of the same remedy.

Corneal scars (*nebula, macula*) are most likely to be reduced in area and thickness by pressure-massage with stimulating ointments. One of the best of these, to be applied once daily for weeks or months, is—

Yellow oxide of mercury,	$1\frac{1}{2}$ grains	(0.10);
Iodol in fine powder,	$7\frac{1}{2}$ "	(0.50);
Vaseline,		
Lanolin,	of each 75 "	(5.).

Scleritis and Episcleritis.—Inflammatory patches characteristic of both these affections have been successfully treated by the application of the galvano-cautery. Internal treatment is almost always called for, and search should be made for the presence of any of the well-known causes of these diseases. Absorption of the scleritic plaques is certainly helped by massage with an ointment composed of sodic iodide 0.25 gramme and vaseline 10 grammes. If the deeper structures of the sclera be affected, Puech has advised the painting of both lids every morning for five days with the ordinary tincture of iodine. Finally, subconjunctival injections, as described under Iritis, are found to act well in most instances.

Herpes of the Cornea.—*Herpes zoster ophthalmicus* is usually a part of a neuritis affecting the minute nerve-endings in and about the conjunctivæ and lids and it should be treated in connection with the other manifestations of the disease. The corneal vesicles are serious lesions, owing to the resulting scars and the possible visual defect that so often remain when the eruption occupies the pupillary area. Bourgeois advises that the eye be carefully irrigated with warm boric acid lotion and the cornea afterward dusted with the following powder:

Bismuth subnitrate,		
Powdered starch,	of each 62 grains	(4.);
Aristol or iodol,	$7\frac{3}{4}$ "	(0.5).

In addition, the eye should be protected and pain relieved by morphine or antipyrin. When there is iritis dry heat and a collyrium of $\frac{1}{4}$ per cent. solution of scopolamine are also indicated.

To the vesicles on the lids may be applied this salve:

Zinc ointment,	6 drachms (22.50);
Boro-glyceride,	2 drachms (7.50);
Carbolic acid,	26 grains (1.75).

Or, when the pain is very severe, this:

Cocaine muriate,	$7\frac{1}{2}$ grains (0.50);
Iodoform,	1 drachm (4.);
Vaseline,	$7\frac{1}{2}$ drachms (100.).

The pain of herpes is also greatly mitigated by the local application to the vesicles or dried scabs of finely powdered euphorin (phenyl urethan).

IRITIS.

Inflammation of the iris is one of the commonest and most important ocular diseases with which the practitioner has to contend. In the great majority of instances it is symptomatic of some general disorder or accompanies some other disease of the eye. It is well to remember that it may be a local expression of syphilis, rheumatism, gonorrhœa, tuberculosis, gout, scrofula, or diabetes. These general diseases should always receive attention as a part of the treatment of iritis because the duration and severity of the ocular affection may be considerably lessened thereby.

The pupil should be dilated as early in the disease as possible, and although atropine, duboisine, hyoscyamine, and hyoscine must continue to be the most valuable agents in the accomplishment of this result, we have recently added a number of other valuable mydriatics to the list.

An excellent and effective substitute for the ordinary 1 per cent. solution of atropine, usually ordered in cases of iritis, is the following:

Neutral sulphate of duboisine,	
Neutral sulphate of atropine,	of each $\frac{1}{2}$ grain (0.03);
Cocaine chlorhydrate,	35 grains (2.);
Distilled water,	7 ounces (190.).

Instillation of a single drop of a $\frac{1}{2}$ per cent. of scopolamine hydrochlorate forms an effective substitute for atropine preparations. All of these cycloplegies may give rise to general toxic symptoms if care be not employed in the use of their watery solutions. When possible these should be instilled after meals. Only one drop at a time should be dropped into the conjunctival sac, and the excess of fluid should be carefully wiped, from the inner canthus outward, off the closed lid-edges.

The treatment by means of subconjunctival injections of corrosive sublimate may be carried out in accordance with the directions of Abadie, *i. e.* four or five doses of $\frac{1}{20}$ of a milligramme ($\frac{1}{1200}$ of a grain) each, at intervals of three days. It has recently been observed that from 5 to 10 drops of a sterile 2 per cent. solution of common salt, injected with a perfectly clean hypodermic syringe, answer all the purposes of the bichloride and are not as painful. Even in syphilitic cases mercurial salts appear to possess no curative advantage over the sodic chloride solution. Indeed, it is now claimed that all subconjunctival injections act chiefly by stimulating the lymphatic circulation and thus hastening the absorption of inflammatory products. The pain following this form of medication is not invariably prevented by the use of cocaine. Instead of presenting such anti-rheumatic remedies as the salicylates in *rheumatic* iritis Crinon advises the tincture of gelsemium in full doses daily. In *gonorrhœal* iritis Fuchs advises 15-drop doses, once a day, of the oil of gaultheria, which is best given in capsules.

The internal treatment of *serous* iritis is considered of importance by Galezowski. He advises that the urate of piperazine be given in $\frac{1}{2}$-gramme doses once or twice a day.

The treatment of the *tubercular* form of iritis is not very satisfactory. The exhibition of creasote (dose 0.05 gramme) in pill form, six times daily, increasing the dose until fifteen pills are taken in twenty-four hours, is recommended by Quint. This treatment should be continued for months. Another remedy is ichthyol. Four drops of a mixture composed of equal parts of this drug and water should be administered three times daily before eating. The dose should be increased one drop daily until forty drops are taken at one dose. To avoid gastro-intestinal irritation the ichthyol should be administered in a large quantity of water. Iodoform, triturated with one-half its weight of powdered coffee, may also be administered in cachets.

It is sometimes difficult to make a differential diagnosis between the tubercular and other forms of iritis. In such cases tuberculin injections may be used. Indeed, Leber has reported a complete cure of tubercle of the iris after ten injections (5 to 10 milligrammes each) of Koch's lymph.

GLAUCOMA.

Richey and others regard this disease as essentially one affecting the general nutrition. In any case it must not be forgotten that subsequent attacks may be warded off by general constitutional treatment, by dieting, regular bathing, proper exercise, and keeping the bowels freely open. When signs of gout are present Houde's formula is valuable:

Crystallized colchicine,	1 grain (0.06);
Sugar of milk,	1 drachm (4.);
Gum arabic,	7 grains (0.50);
Simple syrup,	15 " (1.).

Divide into 60 granules and give two, three, or four daily. In the same way, rheumatism or any of its manifestations should be carefully treated. But whatever be the predisposing cause of this formidable disease of the eye, it is directly dependent upon a disturbance of the intraocular lymphatic system. The internal lymph-stream arises from the blood-vessels of the uveal tract, flows from the posterior chamber through the pupil, and empties into the canal of Schlemm at the angle formed by the iris and the sclera. It is easy to understand how any obstruction of this stream of lymph or any abnormal increase of the lymphatic fluid may bring about an intraocular tension dangerous to vision. The eyeball grows harder and the delicate parts within the eye immediately suffer. It is of the utmost importance that this destructive disease should be early recognized, and should not be mistaken, as it often is, for supraorbital neuralgia *plus* conjunctivitis or iritis (see table on p. 985). When such an error is made, atropine or some other mydriatic is likely to be prescribed and a bad matter thus made worse.

Although the most satisfactory measure is a broad, peripheral iridectomy or a posterior sclerotomy, relief sometimes follows certain local applications. In *acute* glaucoma Faber advises the use of pilocarpine nitrate, 0.05 gramme to 10 grammes of distilled water; this is to be dropped into the eye every three or four hours, as long as the intraocular tension is increased. The artificial leech and the internal administration of morphine are recommended for the relief of pain. In the *chronic* form a 25 per cent. solution of antipyrin may be injected, with Anel's lachrymal syringe, into the nasal duct of the affected eye. This procedure not only relieves the pain of the disease, but is recommended as a curative measure.

TOXIC AMBLYOPIA.

A GREAT many poisons exert a deleterious action upon the eyesight, but the most important and most common of these are tobacco and alcohol. They set up a chronic and painless inflammation of the optic nerve, which, however, readily yields to treatment.

There should be total and immediate abstinence from the use of tobacco and alcohol in any of its forms, and the patient should observe every other hygienic rule. When there is no contraindication a Turkish bath twice a week is a valuable remedy. Some such tonic mixture as the following should be prescribed:

Tincture of iron chloride,	4 drachms (16.);
Dilute phosphoric acid,	4 grains (0.25);
Quinine sulphate,	6 drachms (24.);
Strychnine sulphate,	2 grains (0.1);
Tincture of rhubarb,	2 drachms (8.);
Simple syrup,	to make 8 ounces (250.).

A small teaspoonful in a wineglassful of water before each meal.

Hypodermic injections of a 1 per cent. solution of nitrate of strychnine should also be administered three times a week. This solution should be made with distilled water and without alcohol. The initial dose must be small, say five drops, to be increased drop by drop until toxic symptoms are produced. The dose should then be decreased a few drops until the cure is complete.

OCULAR AFFECTIONS IN GENERAL DISEASES.

THERE are certain signs and symptoms exhibited by the visual apparatus and complained of by the patient that do not necessarily indicate organic ocular disease at all, or point only to a partial or secondary involvement of the eye. Graves' or Basedow's disease is one of these. In recent years a number of internal remedies have been employed in the treatment of the eye-symptoms. Chibret gives large doses of sodic salicylate, $\frac{1}{2}$ to $\frac{4}{5}$ of a gramme, four times during the twenty-four hours, dissolved in a large quantity of water. If the patient cannot take such a large dose the amount is diminished, but it must be given for weeks at a time. He has seen improvement, especially of the tachycardia, in a very few days. The following mixture may be taken every two, three, or four hours, unless intoxication is produced, for several weeks at a time:

Powdered digitalis leaves,	$\frac{1}{3}$ grain (0.02.);
Ipecac,	$\frac{1}{2}$ " (0.035.);
Extract of opium,	$\frac{1}{20}$ " (0.0025.).

Amelioration of the symptoms is noticeable in a few days and in some cases a practical cure has been brought about after several months. Exalgine (methyl-acetanilide), in 3-grain doses three times a day, has also been employed with success. Finally, Bogroff has advised the hypodermic injection of extract of the thyroid gland, beginning with a single drop of the organic extract, and increasing the dose until four cubic centimetres are administered.

SYMPATHETIC OPHTHALMIA.

It has been demonstrated to a certainty that germs may be carried from an eye whose coats have been perforated, either by traumatism or from disease, to the opposite eye and there set up a destructive inflammation. The most dangerous wounds, so far as concerns their liability to produce sympathetic opthalmitis, are those that penetrate the region of the ciliary body. This is an area four or five millimetres in width that extends around and a few millimetres outside of the sclero-corneal junction, called by Nettleship the "dangerous zone." Pieces of steel and other foreign bodies lodged in the interior of the eyeball, as well as perforating ulcers of the cornea, may also light up the disease. The earliest sign of this *migratory ophthalmia* is tenderness on pressure over the ciliary region—the patient flinches when the eye is pressed upon. With this are usually noticed inability to read, slight photophobia, lachrymation, and some redness of the eye. Usually there is no pain. The stealthy setting in of these symptoms on the sound side, after a penetrating wound of the other eye, may well cause anxiety, especially when to the tenderness are added sensible impairment of vision, pain, more lachrymation and photophobia, and a deeper injection of the pericorneal vessels. Plastic deposits now take place in the ciliary body, iris, and cornea. If relief be given the eye may partially or wholly recover, but in any event the course of the disease is always very chronic, very variable, and very wearisome to both patient and surgeon. It sometimes happens that months after an attack of sympathetic inflammation the injured eye is found to possess better vision than its fellow. In consequence of improved treatment better results have, in late years, followed the exhibition of remedies for *ophthalmia migratoria*. In the early stage (of sympathetic irritation) it may sometimes be aborted by the inunction of mercurial ointment and the injection, into the vitreous chamber, of one or two drops of corrosive sublimate solution, 1 : 500. This is to be repeated in eight days. Instead of intraocular injections subconjunctival medication has been employed with success, in the strength of 1 : 1000.

Even when sympathetic inflammation has plainly declared itself large subconjunctival injections, combined with the hypodermic use of mercuric iodide or chloride or the inunction treatment, may so modify it that useful vision may be retained in one or the other eye.

OCULAR HEADACHE.

Migraine or sick-headache is frequently accompanied by temporary disorders of sight and is often produced by refractive errors and anomalies of the ocular muscles. Before or during an attack of this distressing form of neuralgia a peculiarly shaped cloud, having often a bright-colored margin, appears before one or both eyes. This spreads until the whole field of vision is obscured and lasts but a short time, after which sight is as perfect as before the attack. Attention should be paid to the refractive condition of the eye, and when ametropia (especially astigmatism and hyperopia) is present proper correcting glasses should be prescribed. In addition to this, numerous prescriptions have been lately suggested for the relief of the pain or for the purpose of aborting the attacks. Among the most reliable of these is the following:

Antifebrin,		1 grain (0.06.);
Phenacetin,		
Exalgine,	of each	1 " (0.05.);
Antipyrin,		8 grains (0.50.);
Cocaine muriate,		$\frac{1}{12}$ grain (0.005.).

This powder is to be given, as early as possible in the attack, every half-hour, but not more than four doses in all should be taken.

The diagnosis of simple ocular headache, as distinguished from migraine, is of such very great importance to the general surgeon that it must be considered as a prelude to the subject of treatment. As I have said elsewhere, it is manifestly the duty of every practitioner, be he specialist or non-specialist, to instruct himself in the natural history of all forms of headache, whether he aspires to remove the cause in a given case or not. Such knowledge would, for instance, deter the oculist from attempting to treat a malarial headache by cutting the external rectus muscle, the surgeon from dividing the supraorbital nerve for the cure of a unilateral neuralgia due to monocular astigmatism, the physician from persevering with quinine, phenacetin, or antipyrin to effect a cure of that frontal distress which accompanies and is one of the common symptoms of recurrent glaucoma; the rhinologist from making the devious ways of the nasal meatus straight because his lady patient complains of the dull vertical

headache of uterine disease, and so on to the end of the chapter. The characteristics of *ocular headache* may be set down as follows:

1. *Forty per cent.* of all headaches and *eighty per cent.* of all frontal headaches are partially or wholly of ocular origin. They are of all varieties, from a "dull sensation" to suffering of the most intense character, and may affect the patient at any time of the day, but they practically never wake him from sleep.

2. Their site, in order of frequency, is supraorbital, deep orbital, intracranial, temporal, supranasal, vertical, and occipital.

3. Near work is their chief exciting cause—*i. e.* reading, writing, drawing, painting, fancy-work, typesetting, typewriting, sewing, music, etc.

4. Patients suffering from ocular headache often observe that other eye-symptoms also result from the use of the eyes for near work—especially with artificial illumination.

5. Shopping, theatre- and church-going, as well as riding in street cars and railway trains, often induce it.

6. The letters and lines in reading and notes in music blur, run together, and get "mixed up."

7. The patient with ocular headache is generally astigmatic or has some refractive error.

8. Patients with ocular headache often complain of lachrymation, photophobia, foreign-body sensation, specks floating before the eyes, itching and burning of lids, redness of eyes, etc.

9. The symptoms of eye-strain above mentioned may be present and the headache be of ocular origin, although the vision is normal and there is no manifest astigmatism. The patient in such a case overcomes his hypermetropia or astigmatism, or both, by continuous muscular effort.

10. About *ten per cent.* of all ocular headaches are *incurable*.

For the temporary relief of this form of headache there is probably no better local application than the so-called oleate of veratrine, and it is certainly preferable to the internal administration of many vaunted specifics. The formula is—

Veratrine,	150 grains (10.);
Oleic acid,	$3\frac{1}{2}$ ounces (100.).

The skin over the painful region is to be first thoroughly rubbed with a dry towel and then massaged with a very small quantity of the ointment. This is a very irritating mixture and care should be observed that none of it is introduced between the lids. The application may be repeated every hour or two, but the possibility of intoxication, due to absorption of the veratrine, should not be forgotten.

PARALYSIS, SQUINT, AND OTHER MUSCULAR DISORDERS.

Abnormal attitudes of the eyeball are taken in cases of *heterophoria* (muscular insufficiencies), *ocular paralysis*, and *strabismus* or squint.

When affected by either squint or paralysis, both eyes are not directed toward the same quarter in all positions of the globes. One disease may easily be differentiated from the other by the simple expedient of testing the excursion of each eyeball in all directions. Examined separately they will be found to have a normal excursion in squint while restricted movement in one or more directions can be detected when a muscle (or muscles) is affected by paralysis.

Paralysis.—Although it is usual to speak of paralysis of the eye-muscles, yet for clinical reasons it is advisable not to forget their nerve-supply. For, as a matter of fact, it is the nervous function that is disturbed or abolished, and if one recollects the ocular innervation paralytic diseases of the muscles resolve themselves naturally into well-defined clinical groups. It is mainly for purposes of diagnosis—when one wishes to discover what particular muscle is involved—that prominence is given to the loss of muscular function.

There are certain symptoms common to all forms of paralysis. The most important of these is *diplopia*. This occurs in every instance where vision in both eyes is good, and is due to the fact that images of objects do not fall on corresponding parts of both retinæ. It is by the relation of these double images—a somewhat difficult subject for the student—that most authors seek to indicate the particular muscle affected. Vertigo and even nausea—the nervous effects of the diplopia and of false projection—as well as indistinct vision are symptoms frequently complained of. Headache is not uncommon. The patient, to avoid the annoyance of double vision, will usually close one eye or turn his head toward the paralyzed muscle. This sign often indicates which muscle is affected.

Causes of paralysis are chiefly rheumatic or syphilitic affections, either of the nerves themselves in their course from the brain or of their nuclei. Organic deposits in the bony canals along which most of the cerebral nerves run, or exostoses from their walls, as well as growths from the neurilemma, may exert pressure sufficient to bring about a temporary abolition or a total loss of their function. The reabsorption of these growths or deposits may result in a cure unless too great damage has been done to the nervous elements. When one nerve alone is affected the cause is probably a peripheral one, while nuclear paralysis is to be suspected if more than one nerve suffers.

Although syphilis and rheumatism play a very important rôle in

the causation of these pareses it is sometimes difficult to demonstrate their presence. A few cases, however, result uniformly from one cause; paralysis of the external rectus, for example, almost invariably occurs in rheumatic subjects. Diphtheria sometimes produces orbital paralysis and is a cause of cycloplegia with dilated pupil (iridoplegia). These paralyses are present in (usually as an early indication of) locomotor ataxia. Paralysis of the external rectus is not unusual in diabetes.

Diphtheritic paralysis and the *primary* paralysis of tabes almost invariably disappear. So do most of those that depend upon peripheral causes. If of central origin many syphilitic cases get well, but some do not. For obvious reasons the later tabetic pareses persist, as well as many others of central origin.

It is justifiable to cover the affected eye with a shield so as to guard against the troubles of diplopia. Specific treatment will be given when it is indicated, and even when there is no definite history of syphilis potassic iodide, administered in gradually increasing doses until 30 or 40 grains or more are taken three times daily, may be continued for several weeks or months.

In conjunction with the internal administration of potassic iodide (in cases of paralysis suspected to be due to syphilis), De Wecker advocates the hypodermic use of corrosive sublimate, and advises this formula:

Mercuric chloride,	15 grains (1.);
Sodic chloride,	30 " (2.);
Morphia acetate,	6 " (0.40);
Distilled water,	$3\frac{1}{3}$ ounces (100.).

A Pravaz syringeful contains 0.01 centigramme of sublimate. One-half of this should be injected daily, or every two days, observing strict antiseptic precautions. Ten injections are usually sufficient. De Wecker asserts that this form of medication is valuable even in the non-syphilitic varieties of ocular pareses.

Cupping the temple in the early stages and the employment of the constant current (2–4 milliampères) are remedies of extreme value. Cocainize the eye and place the negative pole (a small sponge) between the lids directly over the paralyzed muscle. The positive pole may be applied to the neck. This can be kept up for three or four minutes at a time and is a better plan than the usual application of a larger sponge to the closed lids.

Strabismus or Squint.—This affection is sometimes called "concomitant" squint, because, although the relation of the visual axes is not a normal one, it is a constant relation—one eye moves about

when the other does. In "paralytic" squint this is not the case. Much confusion arises from the calling of paralytic diseases "squint," and it would be better to confine that term to the conditions about to be described.

The two most important and by far the commonest varieties of this disease are *convergent* and *divergent* strabismus.

Most squinting eyes manifest themselves if the patient be directed to look first at a near point, say 30 cm., in front of his nose and then at some distant object.

In the early stages of the crossed eyes of children convergent strabismus may be checked by preventing the use of the vision for near work. The kindergarten school should be avoided, and the child encouraged to play out of doors. He should not be taught to read or allowed to play much with toys requiring near vision until the time arrives for glasses or operation. One drop of a weak (1 : 500) solution of scopolamine, rotoin, or atropine (1 : 250) should be dropped into each eye twice a day for two weeks out of every month, as long as swelling of the lids, dry throat, or flushed face is not produced. As long as the pupils are dilated from this use of mydriatics dark glasses should be worn. Later, the patient should be given a *full* correction of all refractive errors. Weak scopolamine or atropine drops are also to be prescribed for a few weeks and glasses worn constantly. In a fair percentage of hypermetropic cases this alone will bring about a complete cure in the course of several months or a year. If, after such a trial, little or no improvement results, an operation is indicated.

DISEASES OF THE EAR AND THEIR TREATMENT BY THE GENERAL PRACTITIONER.

By S. MacCUEN SMITH, M. D.

GENERAL CONSIDERATIONS.

As the title of this chapter indicates, the following pages will be devoted to a brief consideration of the more common diseases of the ear, the treatment of which should become quite as requisite a part of the practice of every physician as the more prominent branches of general medicine and surgery. The fact that the medical profession has not duly appreciated this responsibility, so justly imposed upon it, enables us to account for the present multitude of aural diseases, so many of which tend to become incurable and eventually act as a daily menace to life itself. When we remember that the great majority of ear-diseases will yield to prompt and efficient measures for relief, if instituted in the acute stages of the attack, it would seem almost unpardonable to permit the existence of so many chronic aural affections.

Speaking generally, serious complications result chiefly from the chronic form of aural disease. The inclination, therefore, has been to feel secure, at least as regards danger to life, when an acute disturbance is under treatment. The experience of the writer, however, has been quite contrary to this usually accepted rule; in fact, within a period of eleven months he has seen twenty-seven cases of mastoid disease,[1] each one of which was directly traceable to an acute inflammation of the tympanic cavity. In some of these cases the mastoid empyema was clearly due to meddlesome interference, while in others no treatment whatever had been established. We frequently find that physicians make no attempt to treat acute conditions of the ear, either from an entire lack of interest or because they have been taught that the treatment of aural disease was quite difficult, and often attended with considerable danger. This incorrect impression has undoubtedly hindered the general practitioner from acquiring methods of recognizing and relieving the many acute diseases of the ear, and prevented this very important branch of medicine from becoming the benefit to

[1] Many of these cases were treated in the Otological Clinic of the Jefferson College Hospital.

suffering humanity that it is otherwise capable of being. As acute diseases of the ear are usually seen first by the general physician, the future welfare of the patient makes it imperative that the gravity of the affection should be immediately recognized and prompt measures for relief instituted, in order to prevent the disease from passing into a chronic state, accompanied, as so frequently happens, by most serious results.

Etiological Factors.—The great majority of ear-diseases occur in infancy and early life, and especially during the prevalence of the exanthematous fevers. It is of the greatest importance, therefore, that the ears should be given especial care during these attacks, as the tympanic infection is liable to at once become severely purulent, and thus cause rapid destruction of the soft parts. It should be remembered that, with one or two exceptions, a strictly primary disease of the tympanic cavity or labyrinth never occurs. The etiology, therefore, should be carefully considered before treatment is instituted, or failure to improve many cases must be a natural consequence.

Next to the eruptive fevers, the most frequent cause of aural disease is an extension of some pathological lesion from the naso-pharynx through the Eustachian tube into the cavity of the middle ear. The nose and throat, therefore, frequently present etiological factors other than those of the infectious fevers which must not escape observation and correction. In brief, it is safe to assume that most aural affections are secondary to some other existing trouble, the correction of which is as important an element in the line of treatment as the relief of the ear-disease itself; and experience has shown that the failure to recognize this simple fact has been the chief cause of much inefficient treatment.

We may here call particular attention to the influence that epidemics of infectious influenza (*la grippe*) have exerted as a causative factor in the development of severe aural disease. The specific poison (bacillus of Pfeiffer) seems to have a special predilection for causing an active infection (by continuity) of the middle ear, and subsequent or even simultaneous implication of the mastoid. These complications have been quite common during the recent epidemics, and were characterized by the inflammation being very severe, with increased suffering and a manifest tendency for repair to take place slowly, although ultimate recovery was the rule.

Anatomical Relations.—The brevity of this article will make it necessary for the writer to assume that the reader is sufficiently familiar with the anatomy of the ear, and the methods of examination of the same, to enable him to effectively apply the various therapeutic measures suggested for the relief of pathologic conditions. It should be remembered, however, that the same integument that envelops the

auricle extends into and acts as a covering for the external auditory canal, and finally, being considerably modified, forms the outer layer of the membrana tympani; and also that the mucous membrane of the throat and naso-pharynx extends up through the Eustachian tube, forms the lining of the tympanic cavity, covers the ossicles, extends into the mastoid process, and comprises the inner layer of the membrana tympani. By bearing in mind these anatomical facts one can readily appreciate the facility with which disease may be conveyed by continuity into the middle ear and mastoid. Furthermore, it will serve to make us more cautious when making applications or treating this organ, so as to avoid stirring up any inflammation by rough treatment.

In order to understand why so many fatal complications arise from a disease of the tympanic cavity, it is only necessary for us to recollect that the walls of the tympanum are always thin, and in some cases the roof is entirely absent; and also that a portion of each of the temporo-sphenoidal lobes and the lateral lobe of the cerebellum are in direct contact with the middle ear. We should also remember that the carotid canal (through which passes the carotid artery) forms the anterior wall of the tympanic cavity, and the jugular fossa (in which lies the bulb of the jugular vein) constitutes the floor of the tympanum. This explains how a dangerous and even fatal hæmorrhage may occur as the result of caries and necrosis caused by a destructive suppurative disturbance of the middle ear.

DISEASES AND INJURIES OF THE AURICLE.

Notwithstanding the exposed position of the auricle, diseases due to traumatism are comparatively infrequent, this immunity being due to the elasticity of its framework. With one exception (othæmatoma), affections of the auricle, such as scalds, burns, frost-bites, cysts, warts, tumors, malignant or benign, occur as in other parts of the body. Their treatment, being the same as that adopted in other localities, need not be further considered here.

Othæmatoma, or Blood-tumor of the Auricle.—This peculiar sanguineous tumor may appear on any part of the anterior surface of the auricle, and is either idiopathic or traumatic in origin. In the former variety it is mostly seen in persons affected with cerebral disease, although it is probable that many cases supposed to be spontaneous are in fact due to traumatism, either self-inflicted or the result of violence on the part of an attendant. Whatever the etiology of this tumor, it appears as a swelling, which at times fills up the entire con-

cavity of the auricle, and causes considerable bulging outward. This swelling is due to the effusion of blood or serum between the perichondrium and cartilage, thus separating the one from the other. Should this fluid be allowed to remain thus confined, it will either gradually become absorbed or go on to suppuration.

Treatment.—Traumatic cases receive most benefit from cold applications, especially during the acute inflammation. Applications of the tincture of iodine, gentle pressure, and massage of the tumefaction are advocated by various authors. Should the case be seen early, while the contents are fluid, the best results are obtained by free incision and thorough evacuation of the tumor, followed by packing with iodoform gauze, and moderate pressure, to prevent deformity as much as possible. This same treatment should also be carried out in cases of suppuration.

Generally, it is well to first try expectant treatment, but, if this fails, evacuation of the tumor under the usual antiseptic precautions will give the best general results, although some deformity usually occurs. When possible, the line of incision should be so directed that the subsequent cicatrix may be somewhat hidden beneath the margin of the helix. The gauze packing must be renewed for several days, or until the cavity of the wound assumes a healthy appearance, when sutures can be used to coaptate the edges, the pressure being continued until repair is complete. When this has been accomplished, massage will prove of service in preventing a recurrence of the disease.

OBSTRUCTIONS AND DISEASES OF THE EXTERNAL AUDITORY CANAL.

Impacted Cerumen.

The accumulation of what is usually known as "wax in the ear" is very common, its composition being either cerumen, desquamated epithelium, inspissated pus, or hairs, or several of these intermingled.

As a rule, patients are not conscious of the accumulation until they suddenly experience more or less impairment of hearing. So long as the mass does not completely fill the canal it does not usually interfere with the hearing. The ceruminal glands are mostly confined to the cartilaginous portion of the canal; the collected wax, therefore, will generally be found just beyond the meatus, in which position its removal will be accomplished without difficulty. At times, however, the accumulation is located in the osseous portion of the canal, and may impinge upon the membrana tympani, producing marked deafness. Its removal from this locality without injury to the canal or drumhead requires considerable care, and espe-

cial caution will be necessary where extreme narrowing of the canal is present. When a collection of wax is found in the deep meatus, it is probable that it was pushed into that position either by an attempt at its removal or by some meddlesome efforts to cleanse the ears. The sudden deafness sometimes produced by impaction is caused either by the mass becoming moist, allowing it to completely fill the canal by swelling, and so exclude all sounds, or, in an effort to remove the wax, the plug is forced against the membrana tympani, suspending the function of the conducting apparatus, or a small fragment becomes detached and falls against the drumhead, causing tinnitus and deafness.

TREATMENT.—The removal of this obstruction can be accomplished either by the syringe or by various instruments. Those not familiar with the use of instruments in the ear will find the syringe safer and more satisfactory. Fluids should always be *warmed* before being used in the ear. Should the mass be soft it can easily be dislodged by syringing with warm water in which some bicarbonate of sodium has previously been dissolved. Undue force should never be used. When the mass is hard and difficult to dislodge, or syringing produces pain, further efforts for its removal should be discontinued. The patient is then instructed to use some drops (warmed) in the ear (sodium bicarbonate grains 15, glycerin and water, of each half an ounce) for one or two days, to soften the wax, when the obstruction can easily be removed by renewed syringing. Any accumulation that is not removed by this procedure will require the use of a small hook-shaped instrument (Fig. 41) for its entire extraction, or to sufficiently loosen it so that additional syringing will wash it out.

The best syringe is one with a thin, straight nozzle, holding about four ounces. After directing the patient, or an assistant, to hold a concave ear-basin to catch the return water, the canal is straightened by drawing the auricle outward and backward, the syringe being first filled with water. The nozzle should never be introduced farther than just within the external meatus. In this position the solution is slowly forced from the syringe with a rotary motion, the object being to direct the water so that it will pass between the wall of the canal and the obstruction, and not in the direct central axis; in this manner we permit a free return of the water, and do not at any time throw the stream of fluid directly against the membrana tympani—a matter of much importance in many cases. When the return water is quite clear, all the wax, as a rule, will have been removed. The canal should now be dried with absorbent cotton, followed by the application of ung. hydrarg. ox. flav., and a small piece of sterilized cotton should be kept in the meatus for a day or two, to guard against atmospheric changes. In uncomplicated cases normal hearing is usually restored.

While on this subject it is well to enter a serious protest against the popular habit, so uniformly adopted, of dropping oily solutions and other equally objectionable substances into the ear for the relief of pain, etc. These so-called domestic remedies can have no function except their manifest tendency to act as fungus-generating fluids, and thus frequently transform a simple disease into one of serious moment. If a patient suffers pain or other inconvenience from the ear, the case requires intelligent care, and not the adoption of the "hit or miss" methods above alluded to.

Foreign Bodies in the Ear.

It is usual to divide foreign bodies in the ear into animate and inanimate. The animate class comprises every variety of vermin (usually due to personal filth) and insects. Maggots are sometimes found adhering to the drum-membrane, and generally cause considerable pain, tinnitus, and vertigo. The removal of animate objects can usually be accomplished by using the syringe in the manner already described. At times they will adhere tightly to the lining of the canal or membrana tympani, when it is best that they should first be killed by chloroform vapor, or the instillation of equal parts of tincture of opium and tincture of belladonna, before syringing. The opium and belladonna solution will promptly destroy all animate objects and at the same time exert an anodyne effect which relieves the suffering.

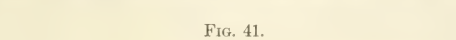
Inanimate objects may be separated into two classes: those that are capable, through heat and moisture, of swelling and becoming so enlarged as to completely fill the canal and act as a source of serious irritation, such as beans, coffee-berries, corn, peas, etc. The other class includes objects not materially influenced by heat and moisture, such as cotton-wool, small pieces of slate-pencil, wood and stone, beads, shells, cherry-stones, shoe-buttons, etc. Cases are not infrequent where foreign bodies have remained in the ears for a number of years without producing symptoms of any note. These substances, however, when influenced by heat and moisture usually make themselves felt within a short period; the swelling first causes deafness, and later, as the tension increases, more or less pain. It must be remembered, however, that the serious damage that frequently follows a foreign body in the ear is not so often due to direct irritation from the presence of this foreign matter as it is to the result of *unskilful attempts at its removal.*

With a good light, a head-mirror, and a speculum of proper size, there should be no difficulty in discovering the presence of a foreign body in the ear. Should the object be deep in the canal, and the anterior meatus inflamed and swollen, some trouble may be experienced until the inflammation has been reduced.

Treatment.—The removal of foreign bodies from the meatus will at times severely tax the ingenuity of the most skilful operator. Usually the first thought is to employ instruments of various kinds, and it is the yielding to this temptation that frequently converts a condition of little importance into one of considerable magnitude. Let it be remembered that instrumentation, as a rule, inflicts more or less damage to some part of the conducting apparatus; that the employment of instruments for the removal of extraneous matter from the ear is but rarely indicated, and should only be used under perfect illumination and with extreme care; that the proper use of the syringe and warm water will usually dislodge and expel the majority of all foreign bodies. The cases that present difficulties for their removal are those liable to changes from heat and moisture, such as corn, peas, etc., especially when located deep within the canal and beyond the constriction formed by the junction of the cartilaginous with the osseous canal. The expansion of the tympanic end of the meatus will allow an object of this character to swell so much that its removal as a whole becomes quite impossible. If, therefore, after repeated syringing with hot water or sweet oil (in the manner already described), the obstruction cannot be removed, and you are satisfied that instrumentation is necessary, it is best that the patient be anæsthetized. It is well, however, as soon as general relaxation from the anæsthetic has been accomplished, to again resort to syringing (holding the affected ear downward, resting over the edge of the operating-table) before instruments are used.

Should this final effort with the syringe prove unsuccessful, nothing remains but to employ one or more of the several instruments devised for such purposes. In our experience a very delicate sharp-pointed hook (Fig. 41) will give the best results. The hook is intro-

Fig. 41.



duced flatwise, resting against the canal. As soon as it passes beyond the obstruction the point is rotated in such a manner that with slight traction it will draw the object out, or at least loosen it sufficiently to allow renewed syringing to accomplish the purpose. Other instruments, such as forceps, probes, etc., may also be used, but as the hook above referred to occupies a minimum of space (an essential point), it has in most cases answered our purpose best. Should the foreign body have been forced into the tympanic cavity, it may be necessary to separate the auricle posteriorly, in order to gain direct access to the osseous meatus. If this does not prove effective, the posterior

wall of the canal must be chiselled away until the middle-ear cavity is reached. Such a severe injury to the canal or middle ear may result in fatal cerebral abscess, meningitis, etc., but if this is avoided the prognosis is always favorable as regards serious consequences, although much damage to the hearing from careless manipulation is of common occurrence.

Diseases of the Canal.

Inflammation of the meatus should be considered under two heads, circumscribed and diffuse.

Circumscribed otitis externa, known also as *boil* or *furuncle* of the external auditory canal, as its name indicates is a disease restricted to a definite area. Several distinct boils may, however, occur simultaneously in various parts of the canal, or a succession of furuncles may follow each other; quite a "crop" has been seen in one ear. They are very common and may appear in any part of the canal, but are generally found in the cartilaginous portion. In origin they are either traumatic or specific, the latter class frequently occurring as epidemics. Traumatic cases often result from the irritation caused by the introduction of various chemicals and instruments into the meatus. It has long been a question in the mind of the writer whether all cases of furuncle of the external meatus were not due to micro-organisms. The staphylococcus pyogenes aureus is almost invariably found in the pus of boils of the meatus, and certainly, if this infectious germ can find its way through the skin in so-called "idiopathic" cases, it would seem less difficult to infect a surface already rendered pregnable by an injury. However this thought may be received it is generally conceded that furuncles can be artificially produced by rubbing sound skin with staphylococci; furthermore, boils of this character yield most promptly to the application of powerful germicides.

Predisposing factors in the development of furunculosis are of importance, and will include any disease or condition debilitating the general health, such as diabetes, anæmia, etc. Catarrhal conditions of the throat and nose are noticeably present in those suffering from boils of the meatus; while decay of the teeth, or other dental irritations, should be looked for. To be brief, any disease that diminishes the power of resistance in the tissues of the meatus will eventually convert the parts into a productive field for the rapid development of micro-organisms. If, in this "run-down" condition, one should receive an injury of the canal, and then be subjected to the influence of staphylococci, it can readily be seen why a supposed traumatic case may in reality be one of infection, developed from a specific poison, the injury simply acting as a predisposing cause.

It is an easy matter to overlook small incipient boils. Usually,

however, the introduction of a speculum will cause sufficient local pain to indicate the point of development. In more advanced cases the furuncle is readily seen, but may be mistaken for an exostosis, the differentiation being that the former is exceedingly painful to the pressure of a probe, and that there is a marked tendency to become multiple. The pain from furunculosis is generally severe, especially when the boil is located in the osseous portion of the meatus, where the skin of the canal (acting also as the periosteum) is unusually dense, and resists the tension caused by the formation of pus. For clinical purposes a furuncle in this location is identical with felon of the finger, but is, however, subject to greater necrotic danger. Should a boil develop on the superior part of the osseous canal, and the pus not be evacuated, either by rupture or incision, caries may follow, and this in turn result in fatal meningitis or brain-abscess.

Treatment.—Many lines of treatment, both local and general, have been suggested for the relief of this painful affection; but unless such therapeutic measures have for their object the destruction of disease-germs, they must in a measure be unreliable and disappointing. It must be remembered that the pus from boils is highly infectious; auto-inoculation, therefore, will be frequently encountered unless careful antiseptic precautions are strictly observed, so that the bacteria-laden pus will not reach other parts of the canal. The important object of treatment is the immediate relief of suffering, together with the limitation, modification, or abortion of the inflammatory process. Our ability to accomplish one or more of these purposes will largely depend on the stage the disease has reached before treatment is instituted, as well as the germicidal properties of the remedies employed.

In the majority of cases early incision, followed by an antiseptic dressing, will deplete the parts, thereby relieving the tension and consequent pain. When pus-formation has already occurred, a free incision down to the bone or cartilage is necessary, for the same reason that only a deep incision is of service in a felon: otherwise, continued pain, burrowing of pus, and possibly necrotic changes, may be expected. A majority of incipient boils will be aborted by introducing into the canal a cotton tampon saturated with camphor-phenol;[1] this should be renewed every day or every second day, until all evidence of the furuncle has disappeared. Before a fresh tampon is introduced the canal should be gently mopped out with cotton twisted on an applicator, and saturated with alcohol in full strength. When the boil appears to be eradicated, the camphor-phenol tampon

[1] Camphor-phenol is prepared by mixing 45 per cent. of pure carbolic acid with 55 per cent. of camphor, the mixture forming a liquid of powerful germicidal properties and marked anodyne effects.

should be replaced by one moistened with ointment of the yellow oxide of mercury,

℞. Hydrarg. ox. flav., gr. ij (0.1);
Ung. petrolei, ʒj (30.).
M. et. ft. ung.

or iodoform ointment,

℞. Iodoformi, ʒiij (12.);
Ung. petrolei, ʒj (30.).
M. et. ft. ung.

(cleansing each time with alcohol), until the meatus assumes a healthy condition.

When necessary to incise an aural boil, it should be done thoroughly, as suggested above; the after-treatment being the same as in the incipient furuncle, except that the cotton tampon should be slightly larger than the meatus, as the *pressure* will exert a beneficial influence by favoring rapid absorption and quick recovery. Before a boil is incised the pain incident thereto will be greatly lessened by placing in the canal a camphor-phenol tampon for five or ten minutes. After the pus has been evacuated all suffering will be relieved by immediately introducing a similar tampon. The use of camphor-phenol, when applied for the alleviation or cure of furunculosis of the external auditory canal, is founded on its inhibitory action on the development of the staphylococcus pyogenes aureus, and incidentally on its marked anæsthetic properties. It is, therefore, a powerful germicide and at the same time non-poisonous and non-irritant—an advantage not enjoyed by any other preparation in such concentrated form.

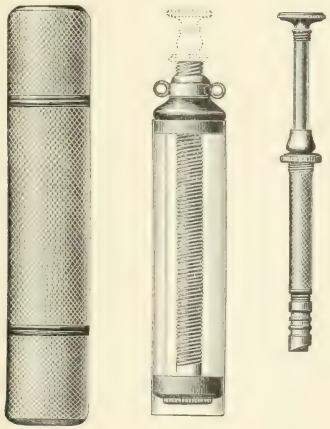
The foregoing line of treatment will meet the requirements of almost all cases of furunculosis of the meatus, and furthermore will prevent auto-inoculation. Other means of treatment are sometimes beneficial, however, and should be used when indicated. In selected cases, bloodletting in front of the tragus, preferably with the artificial leech (Fig. 42), as well as hot antiseptic irrigation, and dry heat, will be of service. Poultices should never be used; the heat and moisture caused by their employment creates an active hotbed for the rapid multiplication of bacteria, and frequently excites an inflammation of the auricle. Moreover, their use is apt to involve the middle ear in an acute inflammation. Any dental irritation, or abnormal condition of the nose and throat should be corrected. In debilitated subjects the general health should receive due consideration. The administration of selected tonics and alteratives, in connection with proper

hygienic surroundings, will do much to assist in the cure of an existing boil, and especially to prevent its recurrence. We would strongly urge the use of arsenic in the form of Fowler's solution, given in increasing does until the physiological effects are produced; a course of this drug to be repeated several times if necessary.

Otitis Externa Diffusa.—In contradistinction to circumscribed otitis externa, the diffused form of inflammation is one that may involve the entire canal, but is usually confined to the osseous portion.

It is claimed that this disease is frequently idiopathic in origin, but we believe it is always due to some direct or traceable cause, keeping

FIG. 42.



in mind parasitic infection. Diffused inflammation of the canal is most frequently associated with a chronic suppurative otitis media, notwithstanding the fact that the discharge may be very slight. It is evident, then, that tympanic suppuration is the most important causative factor in its development; the perforation of the membrana tympani may be very small, and therefore easily overlooked, but careful observation, together with inflation, will prevent our falling into this error. Next in frequency are mechanical, chemical, or thermal irritants, such as the unskilful use of instruments, the presence of foreign bodies, the application of concentrated chemicals, or the introduction into the ear of solutions either too hot or too cold. Certain constitutional disturbances, such as diphtheria, syphilis, scrofula, etc., as well as chronic furunculosis, should receive due consideration.

The important symptom is pain, increasing in severity as the cellular tissue, and subsequently the periosteum and bone, become

involved. Implication of the osseous structure occurs only in neglected and chronic cases. The presence of granulation-tissue indicates bone-necrosis, and should receive particular attention, especially if the roof of the meatus is the part involved, as the inflammation may extend inward and cause meningitis. Considerable swelling of the meatus will be noticed, being more pronounced when the osseous portion is the seat of the lesion. Deafness and tinnitus are prominent symptoms, varying in degree according to the amount of swelling and suppuration, and consequent interference with the function of the membrana tympani. When primarily the middle ear is not the cause of an otitis externa, it may become involved in the inflammatory process by continuity of structure. As previously stated, the presence of *discharge* —always associated with middle-ear suppuration—is an etiological symptom of the greatest importance. Otitis externa diffusa diphtheritica, and syphilitica, have constitutional symptoms and local appearances characteristic of each, making their recognition not difficult.

The gravity and prognosis of individual cases will depend largely upon the etiology, as well as the portion of the canal affected; also whether the inflammation is superficial, or extends to and involves the osseous structure; and lastly, whether middle-ear suppuration is present, in which event considerable swelling of the canal may interfere with the free escape of pus. In all forms of otitis externa, with involvement of the deeper structures, a more or less *chronic dermatitis* may remain after cessation of the acute symptoms.

Treatment.—The term otitis externa diffusa may include all inflammations and irritations of the external auditory canal, except that known as circumscribed (furunculosis). This wide range of inflammatory conditions, therefore, may include either a simple erythema or a severely active inflammation which may implicate the bony structures; or, as in syphilis, diphtheria, etc., may prove to be infectious. Obviously, constitutional treatment is of the greatest importance in some cases, while in others simple local applications will suffice. It is well to regard each individual case as possessing, to some extent, characteristics of its own; hence we should aim to discover the cause, and direct active treatment for its prompt removal (not forgetting the general health), and recovery will follow in most cases.

While the inflammation is acute, bloodletting in front of the tragus, together with hot antiseptic irrigation of the meatus will be of service. A good antiseptic solution for irrigating the ear is the following:

R. Glycerini, f℥j (30.);
Liq. acid. carbolic. (pure), f℥iij (90.).—M.
Sig. Add one-half to one teaspoonful to a half pint of water, and irrigate as the case may require.

The fountain syringe is much safer and better than the hand syringe generally used. Instillations of warm alcohol, black-wash, or lead-water and morphine will, on account of their anodyne effect, be of service:

℞. Liq. plumbi,
Liq. morphiæ, āā. f℥iv (16.);
Aquæ, f℥x (300).—M.
Sig. Add a tablespoonful to a wineglassful of water, and syringe the ear several times daily.

The bowels should be freely opened by small doses of soda and calomel, repeated p. r. n. In mild cases the inflammation will readily subside by first mopping the canal with alcohol, and then applying either ung. hydrarg. ox. flav. or ung. iodoformi, as previously referred to. This should be repeated every second or third day. When the discharge (not due to middle-ear suppuration) persists, nitrate of silver solution (gr. xl to f℥j) applied to the surface is indicated.

Should these measures fail, the walls of the canal must be freely incised in the most dependent point or points. Bleeding should be encouraged, as depletion will give prompt relief, and recovery in most cases is greatly facilitated thereby. After incision the canal can be cared for by application of the ointments above mentioned. Early incision is to be preferred rather than too long expectant treatment, thereby preventing osseous involvement, necrosis, tympanic suppuration, etc. Constitutional treatment must be carefully considered, and therapeutic measures administered for the general benefit of individual cases.

Otomycosis.—This variety of inflammation is due to the presence and rapid multiplication of microscopic fungi in the external canal. The most common form of vegetable growth met with is some variety of the *Aspergillus* (either *fumigatus*, *niger*, or *flavus*). The patient complains of more or less impairment of hearing, and tinnitus; an almost intolerable itching makes the sufferer quite miserable; efforts to relieve this itching by rubbing or picking the ear only add to the progressive discomfort, and may produce an extensive inflammation; some pain is experienced, but usually not severe. An examination with the speculum reveals large quantities of desquamated epithelium. This débris somewhat resembles blotting-paper studded with yellow or black spots, the color depending upon the character of aspergillus present, which, however, can only be definitely determined by microscopic examination. A distinctive diagnostic point in otomycosis is the rapidity with which these masses will recur after removal, sometimes within a few hours.

Treatment.—The accumulation is best removed by warm anti-

septic irrigation, followed by instillations of absolute alcohol. The patient's head should be rested on a table, and the ear filled with warm alcohol, which should remain for a few minutes. This can be repeated two or three times a day until all fungi have been destroyed, after which a few applications of the yellow oxide or iodoform ointment will quickly restore the canal to its normal condition.

DISEASES OF THE MIDDLE EAR.

Diseases of the tympanic cavity have been divided by authors into various forms of acute and chronic inflammation. For all practical purposes it is sufficient to consider diseases of the middle ear under four heads: (1) Acute Non-suppurative Otitis Media; (2) Acute Suppurative Otitis Media; (3) Chronic Suppurative Otitis Media; (4) Chronic Non-suppurative Otitis Media. It is evident, however, that the second form of otitis media is but a continuation of the first, usually made possible only by the neglect or improper treatment of the first variety; likewise the chronic suppurative is only an advanced stage of the acute suppurative, and is also largely the result of neglect or incompetency.

From the foregoing it must be assumed that many cases of both acute and chronic suppurative otitis media are preventable. In support of this assumption we can without hesitation assert that suppurative diseases of the middle ear are the natural outcome (with comparatively few exceptions) of timidity, neglect, or the application of improper treatment to cases of primary inflammation of the tympanum; it is evident, therefore, that if the initial lesion is promptly and judiciously treated, many acute inflammations of the middle ear will be arrested in the stage of hyperæmia, and thus avoid even an acute suppuration, which should in turn prevent the establishment of a chronic otorrhœa. Special mention is here given to this important fact, for the reason that in this day of advanced preventive medicine it is plainly our duty to carry into daily practice the effective measures now at our command, and thus frequently prevent the development of suppurative inflammations of the tympanic cavity, thereby avoiding many formidable complications arising from diseases of the ear.

Acute Non-suppurative Otitis Media.

Acute inflammation of the middle ear without suppuration (also known as catarrhal inflammation) is the most frequent cause of "earache" in infancy and childhood; nevertheless, the real cause of the child's crying and fretfulness is frequently overlooked.

An extension (through the Eustachian tube) into the middle ear of some abnormal condition of the throat and naso-pharynx is the most frequent cause of this form of tympanic disease. Children are very susceptible to draughts of air striking the ear, or any exposure to dampness. Sea-bathing, the careless use of solutions in the nostrils, dental irritation from decayed teeth or during dentition, are likewise exciting factors. An acute otitis media from any of the above causes will usually yield to prompt treatment, care being taken to remove the exciting cause. If, however, the middle-ear inflammation develops during the course of one of the infectious fevers (scarlet fever, measles, diphtheria, etc.), the consequent exudation is usually purulent, and does not respond so quickly to therapeutic measures. Deep-seated pain, increased by pressure on the tragus, is usually the first symptom experienced. The suffering may be intermittent, and mild during the day, but the pain increases at night. Children retire in their usual good health, but their slumber, without apparent cause, is disturbed; sharp crying and a tendency to rub the affected ear, with tossing of the head, are prominent symptoms in infants and young children. These objective signs, together with an examination of the membrana tympani, are all the diagnostic data obtainable in such young subjects. Deafness and pulsating tinnitus, more or less marked, depending upon the extent of the hyperæmia and swelling of the mucous covering of the middle-ear cavity and ossicles, together with a sense of fulness, are additional symptoms complained of by those old enough to make such observations. When a child persists in fretful crying, and the cause of its suffering cannot be otherwise explained, an examination of the *ears* will frequently reveal the true cause of its discomfort. On examination of the membrana tympani vascular injection will be noticed, especially marked along the handle of the malleus; bulging of the membrane may be present, but this is rare in simple catarrhal cases, unless (from neglect) the muco-serous exudate should accumulate in considerable quantity, in which state it will undergo decomposition unless relief is obtained from drainage through the Eustachian tube or by an opening in the membrana tympani. In mild cases the exudation is muco-serous and may give rise to very little suffering; but in the more severe forms it becomes distinctly purulent, associated with great pain, and regularly develops into the acute suppurative form.

Treatment.—We again desire to urge the importance of early and active treatment in primary disease of the tympanic cavity, in order to arrest the inflammatory process before it reaches the stage of suppuration. Bloodletting in front of the tragus by means of the artificial leech (see Fig. 42) is of the first importance in arresting the disease at the stage of hyperæmia and assisting in the relief of pain;

one or two cylinders of blood, or its equivalent (two to four Swedish leeches) should be extracted. In young children a blister in front of the tragus will answer a fairly good purpose when bloodletting cannot be resorted to. Hot sedative instillations, repeated as required to relieve pain, may be employed. Equal parts of tincture of opium and tincture of belladonna, warmed and dropped into the ear, or atropine sulph. gr. iij, morph. sulph. gr. xx, to aquæ f℥j, are valuable sedative solutions possessing marked anodyne effects. To avoid possible constitutional effects, proper judgment must be exercised in the use of the morphine and atropine solution. In severe cases applications of heat (dry or moist) will greatly assist in relieving pain; the heat is best applied by gentle antiseptic irrigation of the canal (through the fountain syringe), or the use of the hot-water bag. The applications must be *hot* to be effective. Irrigation is to be used only when dry heat fails to give relief, and even then the greatest care must be exercised not to use force. The naso-pharynx should be carefully examined and measures applied to correct any abnormal condition. Free purgation by the use of divided doses of calomel and sodium bicarbonate should receive early attention. Salol and phenacetin, or antipyrin in sufficient dose, will be of service in appropriate cases. Pilocarpine, by the mouth or hypodermically, may help to abort the disease if administered early.

Acute Suppurative Otitis Media.

As before suggested, this form of tympanic disease is an advanced stage of the non-suppurative variety, or, in other words, the inflammation, not having been arrested and confined to the muco-serous or catarrhal stage, passes on to the suppurative. The symptoms are similar to the foregoing but are greatly intensified, together with some involvement of the mastoid, which, however, usually subsides with the evacuation of the pus from the middle-ear cavity. The pain is at times most severe and increases in proportion to the distention of the membrana tympani by the progressive accumulation of fluid in the tympanum, until finally the pressure becomes so great that the tension of the drum is overtaxed, and, with a report quite audible to the patient, it ruptures. A copious flow of pus follows, and usually relieves the suffering. By this time, however, great damage has been done both to the membrana tympani and the tympanic cavity. Instead of the opening in the drumhead quickly repairing, as it will do when *incised*, the lacerated edges of the perforation are much slower to mend. The injury done to the delicate mucous lining of the tympanic cavity (due to maceration from pressure) gives rise to a discharge that becomes more or less chronic; whereas, if the accumulation had been promptly evacuated by means of a free incision, the pain would have

been relieved, cessation of the discharge accomplished, and a restoration of hearing produced, all within a few days.

The above is an outline of the average case of acute suppurative otitis media, the treatment of which must be varied, however, in accordance with individual cases, depending chiefly on the etiology. Cases occurring during the course of one of the eruptive fevers or some other severe constitutional disease, such as syphilis, tuberculosis, etc., do not of course respond to treatment so promptly, as improvement of the general health must first be accomplished. It is possible to have an acute otitis media progress to the stage of suppuration with rupture of the membrana tympani without any suffering whatever, the first symptom noticed being the discharge of pus through the external canal. This condition usually occurs in subjects of tuberculosis, which disease should be suspected even in those not previously known to be so affected. On the other hand, the membrana tympani may be so strong as to effectually resist the tension exerted by the progressive accumulation of fluid, and this will tend to find its way into the mastoid or to produce some intracranial complication. Fortunately, however, Nature has wisely provided a drum that will usually rupture of its own accord when the pressure from the accumulated pus reaches the danger-point.

A continuation of pain after the evacuation of fluid from the middle ear would indicate that thorough drainage had not been accomplished, which is accounted for by the opening in the drumhead being too high, or the paracentesis insufficient. Or again, the mastoid may have become involved, or an osteitis of the tympanic walls set up, all of which should receive prompt attention. As the pus or muco-pus accumulates in the tympanum, the drum-membrane undergoes marked changes, and in a corresponding degree the osseous meatus participates in the severe inflammatory process, both becoming extremely red and painful. The membrane loses all its characteristics, the handle of the malleus is no longer seen, and as the tension increases the short process becomes invisible, and finally the drum ruptures, unless other and better means are taken to evacuate the pus. If the opening in the drumhead is now examined, a pulsation, synchronous with the heart's action, will be seen. There will be more or less febrile disturbance present depending upon the severity of the attack.

Treatment.—It is to be assumed that if the patient is seen before actual suppuration has taken place, every effort will have been made to arrest or modify the disease without surgical interference. If, however, the case does not yield to the treatment outlined for catarrhal otitis media, and the pain continues, with bulging of the drumhead, the latter should be immediately incised, the point of election usually being the posterior inferior quadrant. However, as

it is possible for the pus to be confined either to the superior or inferior portions of the tympanic cavity, it is best to open the membrana tympani at the most dependent point; always remembering that in any case the object to be accomplished is the free evacuation of fluid from the middle-ear cavity. The drumhead, therefore, should never be punctured, but, on the contrary, a *free incision* should be made, always extending it down to the inferior surface of the canal, so as to ensure good drainage; otherwise the suffering and danger incident to confined pus will continue. Care should be taken that the incision shall not interfere with the ossicles. It seems scarcely necessary to suggest that surgical interference should only be attempted under good illumination and with perfect antiseptic precautions.

The after-treatment in most cases is very simple, and consists in carefully cleansing the ear every day with sterilized cotton twisted around an applicator, after which the canal is gently filled with a strip of iodoform-gauze. In uncomplicated cases the disease should be relieved in twelve days or less, while the hearing will be restored in about the same length of time. Should pain continue after liberation of the pus (mastoid involvement being excluded) it is probably due to the puncture being too small for the purpose of free drainage, or to a considerable maceration of the mucosa caused by the long-continued pressure of the confined pus. In the former case the opening should be enlarged without delay; in the latter, an application of silver nitrate, 5–40 grains to the ounce of water, should be warmed and applied directly within the middle-ear cavity once daily for several days, or until a healthy condition is produced. One application will frequently give prompt relief from further suffering. Hot antiseptic irrigation should not, as a rule, be used in acute suppurative cases; there are, however, some exceptions. Irrigation is especially serviceable in cases with continued severe pain and profuse discharge, particularly when resulting from one of the eruptive fevers, or from diphtheria. In these diseases, however, a much better and more prompt recovery is obtained by early incision of the membrana tympani. Nevertheless, it will be better to allow the drumhead to rupture (serious as this may be), and employ irrigation, rather than to have the possibility of a grave accident from the careless use of the knife, or an injury done to the canal by the introduction of the iodoform-gauze packing. Early inflation of the tympanic cavity was formerly thought to be an important part of the treatment, but this should not be done until improvement is well advanced, and then only for the purpose of preventing adhesions.

As incision of the drumhead is usually very painful, general anæsthesia should be employed when possible. Local anæsthesia has proved to be uniformly unsatisfactory, in our experience.

Chronic Suppurative Otitis Media.

Chronic suppuration of the middle ear is merely a continuance of the acute disease just described, caused either by a failure to relieve the acute form, or, as is more frequently the case, by the entire absence of any rational treatment. As before mentioned, tubercular suppuration may be primarily chronic and not pass through the acute stage of pain and other disturbance. Diphtheria, scarlet fever, and other exanthemata, on account of their specific nature and the great impairment to the general health they cause, are the chief factors producing chronic otorrhœa. There is always more or less impairment of hearing, depending upon the location of the perforation, the extent of thickening or swelling of the mucosa, and the amount of clogging of the chain of ossicles.

In uncomplicated cases the character of the discharge is that known as healthy or laudable pus. During repair it becomes thin or watery, progressively decreasing in quantity. When intermixed with blood, it indicates the presence of granulation-tissue. Decay of bone is shown by the pus being brownish in color, associated with excessive fœtor. It must be remembered, however, that non-fœtid pus contains large quantities of pathogenic cocci, in which state it is highly infectious, and as dangerous to life as the fœtid variety. In an ear that has been properly cleansed, excessive fœtor will arise only from bone-necrosis, and should elicit immediate efforts for its relief.

The brevity of this article will not allow a discussion of the location of the various perforations of the membrana tympani and their significance, except in so far as the necessity arises for dividing all cases of chronic otorrhœa into two classes, *i. e.* those in which the perforation is situated in the *inferior* part of the membrana tympani, and those involving the *superior* portion, more especially that part known as Shrapnell's membrane (membrana flaccida). This simple classification is advisable from the fact that the line of treatment differs materially in each. Furthermore, the former is indicative of a condition that is not prone to serious complications and usually yields promptly to treatment of the more ordinary kind, whereas the latter variety is always significant of a much more serious disease. Granulation-tissue (always the product of chronic suppuration), and necrosis of the ossicles or walls of the tympanum and mastoid antrum, must invariably be suspected. It will be seen, therefore, that this latter form of chronic otorrhœa is capable of causing a condition so formidable as to at once become a daily menace to life, and which cannot, as a rule, be permanently relieved except through operative interference. When one remembers the very thin plate of bone that separates the middle ear from the interior of the skull and important blood-vessels, and the direct communication with the mastoid antrum and cells, it

does seem remarkable that many more fatal complications do not occur. The longer the suppuration continues the greater will be the destruction of these delicate walls; and hence the danger to life will be correspondingly increased.

Treatment.—We will first consider the treatment of cases in which the perforation is situated in the inferior half of the drumhead, and then take up treatment of cases with the opening in the superior portion. Sometimes the entire membrana tympani is destroyed, the treatment of which condition will come under the second heading. The chief object, in any and all classes of cases, is the use of every available means to relieve or modify a discharging ear, thereby preventing any serious or fatal complications; remembering that the longer the case continues the more imminent the danger becomes. It must not be forgotten, however, that the same formidable implications may occur in the acute disease, but with less frequency. Cleanliness and general antiseptic precautions are so absolutely essential in the successful treatment of all cases, that any deviation from their well-defined principles will generally result in failure. Irrigation with an antiseptic fluid should only be employed in exceptional cases. A better and more thorough way to cleanse the ear is to mop it out with sterilized cotton saturated with hydrogen peroxide until all secretion has been removed, when applications of stimulating or slightly escharotic solutions should be made into the tympanic cavity, as the case may require, depending upon the presence or absence of a tendency to granulations. This should be followed by packing the deep canal with iodoform-gauze, renewed every one, two, or three days, according to the amount of discharge. Repeated cleansing of the ear in this manner (cotton twisted on applicator) with a warm 2 per cent. solution of carbolic acid, hydrogen dioxide, or liq. plumbi subacetatis, followed by the iodoform-gauze packing, will be sufficient to cure most cases of recent date. Those of longer standing may, in addition, require the stimulation of nitrate of silver in various strengths, commencing with 5 grains to the ounce and increasing to 60 grains if necessary. Dusting the surface with acetanilid powder will assist in arresting putrefactive changes, when such an agent is required. An attempt to destroy granulation-tissue can be made with strong solutions of chromic acid or nitrate of silver, or, still better, the application of absolute alcohol. Pain caused by the alcohol will be somewhat reduced by combining with it a 50 per cent. solution of boro-glyceride in the proportion of 1 drachm to the ounce of alcohol. Whatever the line of local treatment, it should be followed by the iodoform-gauze packing. The so-called "dry treatment" by packing the ear full of boric acid or other powder must be condemned on account of its interference with drainage.

Clinical experience alone will enable the practitioner to decide as to which of the foregoing methods should be used in any individual case. If, however, the disease after a reasonable amount of treatment has not been cured, or gives no evidence of ultimate relief, the opening in the membrana tympani should be enlarged (if necessary), and the granulations or other pathologic products gently curetted from the tympanic cavity, followed by the simple treatment above related. This operative procedure should not in the least interfere with the ossicles. After an extended experience it has proven most satisfactory, many cases promptly recovering without subsequent discharge, and the hearing becoming quite normal. This as well as other operative measures should only be attempted by those familiar with such work. As a rule, no effort should be made to hasten repair of the perforation in the drumhead; as suppuration subsides, the gauze packing should be gradually withdrawn from the vicinity of the membrana tympani, which ordinarily heals without further attention. The naso-pharynx must receive due consideration in all cases; as also should the general health, in order to correct any physical disturbance, by the administration of therapeutic measures suitable for individual cases, including proper diet, tonics, etc.

As before mentioned, perforations situated high up in the tympanic membrane indicate a much more formidable disease than those confined to the inferior portion. Extensive granulations, with more or less necrosis of the ossicles and tympanic walls, are usually present, and in turn predispose (by direct continuity of structure) to brain or mastoid abscess; or the infectious matter may be communicated to the dura mater, causing suberanial abscess or diffuse meningitis, or to the blood-vessels in the diploë, giving rise to osteo-phlebitis, thrombosis of the lateral sinus, or pyæmia. The only effective line of treatment in such cases is an operative one, although it is well (unless urgent symptoms arise) to first institute the foregoing line of treatment. If, however, granulation-tissue and decay of bone are present, it is certainly unwise, and even dangerous, to be content with any treatment short of removing the necrotic malleus and incus, and other pathologic products from the tympanic cavity. By this procedure we establish a free drainage, and make an opening into the tympanum sufficiently large to admit of the site of the disease being properly treated; furthermore, if this rational interference be established before brain or mastoid complications have set in, these developments will almost surely have been prevented; besides, the discharge in most cases will cease, and the hearing in the majority of patients greatly improve.

The limits of this article will not permit a consideration of the technique of these delicate operations. Those desirous of further

information on this subject, and a discussion of the many complications and sequelæ arising from suppurative diseases of the ear, are referred to the comprehensive works of Burnett, Sexton, and Dench, or the forthcoming work of Laurence Turnbull.

Chronic Non-suppurative Otitis Media.

Chronic aural catarrh is pre-eminently a disease dependent for its existence upon some catarrhal condition of the nose or throat. The mode of implication is by continuity through the Eustachian tube, both ears usually being affected, although not always to the same extent. The three principal forms of chronic catarrh seen in the naso-pharynx are dry, granular, and relaxed. The dry form is prevalent in hot, dry climates; the surface of the pharynx being so entirely devoid of moisture as to present a glazed appearance. Granular catarrh is, however, quite the reverse, the pharyngeal mucous membrane being somewhat thickened, and projected above this surface are numerous red granulations about the size of a millet-seed. The Eustachian tubes are more or less obstructed, but it is unusual to find complete obliteration of their lumen. This partial occlusion is, however, inadequate to admit the entrance of air into the tympanic cavity in sufficient volume to equalize the atmospheric pressure exerted on the drumhead through the external canal; the result being that the membrana tympani is at times so markedly retracted that it becomes adherent to the promontory of the middle ear. As the long handle of the malleus extends between the layers of the membrana tympani (to which it is firmly attached), it is evident that this excessive retraction must somewhat misplace and suspend the function of both the drumhead and ossicles, thus causing more or less severe tinnitus and vertigo, as the direct result of undue impaction of the stapes into the fenestra ovalis. Unless relief is obtained (a difficult matter in cases of long standing), this condition continues over a greater or less period of time, until finally the labyrinth or auditory nerve becomes seriously implicated, followed by the inevitable result, *deafness*, more or less complete, and generally of a permanent character.

Probably this disease, more than all others, predominates as the most frequent cause of deafness. This can be accounted for from the fact that, until it has become fairly well established, it is virtually an affection without symptoms or discomfort noticeable to the average patient. As the disease is without pain, the first symptom observed by the patient is a slow but surely progressive impairment of hearing, accompanied by a similar gradually increasing tinnitus. The deafness varies considerably from day to day, being worse in damp and cold weather. As time progresses the deafness becomes very marked;

later the patient discovers that he "hears better in a noise" (*paracusis Willisii*), as, for example, when riding on a railway train. This phenomenon indicates that the disease is well advanced, and not very hopeful as regards beneficial treatment. The absence of wax, and an unusually clean polished surface of the external canal and membrana tympani, are objective symptoms characteristic of this disease. The drumhead, however, frequently loses its lustre, and may show considerable opacity, or crescentic areas of calcareous deposits. The absence of bone-conduction renders a case quite hopeless as regards improvement in hearing power, although much can be accomplished for the relief of distressing tinnitus and vertigo.

Treatment.—The objects to be accomplished are the alleviation or cure of the naso-pharyngeal catarrh; the free admission of atmospheric air into the tympanum, and the restoration (as far as possible) of the membrana tympani and ossicles to their normal position.

Manifestly, the degree of success we may attain in one or all of these objects will depend upon the stage at which individual cases are seen. In recent cases the correction of an abnormal condition of the naso-pharynx and gentle inflation of the middle ear by Politzer's method will suffice to restore the hearing. Obstructive growths in the nostrils and post-nasal space must be removed, and every effort made to restore them to a normal condition, which will have a similar effect upon the Eustachian tubes. An alkaline wash for the nostrils and astringent gargles for the throat should be used by the patient at home. Free *nasal* respiration must be established to make other treatment effective. The application of nitrate of silver solutions in varying strengths can be made to the pharynx, as can also—

℞. Tinct. iodi,
Tinct. guaiaci, āā. ʒj (4.);
Tinct. benzoin. comp., fʒj (30.).—M.

Or the following can be applied to the nostrils, the naso-pharynx, and throat:

℞. Iodi, gr. v (0.31);
Creasoti (beechwood), ♏v (0.31);
Potassii iodi, ʒj (4.);
Glycerini, fʒj (30.).—M.

These solutions should be applied two or three times each week, the efficiency of treatment often depending upon the variety of applications used. Injections of various fluids and vapors through the Eustachian tube into the tympanic cavity (their utility being problematical) should only be attempted by those familiar with such work.

If an apparent obstruction in the Eustachian tube does not yield to the proper use of Politzer's method of inflation it is not likely to be improved by the use of the Eustachian catheter, unless in expert hands. On the contrary, its unskilful use is capable of doing serious damage. In cases where the tube is patulous and no adhesions present, the membrana tympani can usually be restored to its position by the use of Politzer's bag, but firm bands of adhesions must be divided before we can secure liberation of the membrane and ossicles. Massage with Siegle's pneumatic speculum, or equivalent apparatus, is of some service in many cases. Hypodermic injections of pilocarpine in sufficient dose to produce profuse diaphoresis can be used with benefit when the internal ear is implicated, especially if a syphilitic tendency is manifest.

Excision of any part of the sound-conducting apparatus should only be employed when relief from severe tinnitus or vertigo is the object of such treatment. It is possible, however, in well-selected cases, to give considerable improvement in hearing, and relief of tinnitus and vertigo, by severing the adhesions between the promontory and membrana tympani, and thus re-establishing the function of the chain of ossicles and the drumhead.

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